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THE HYATT FILTERS.—MANUFACTURED BY THE NEWARK FILTERING CO., NEWARK, N. J.

The accompanying cut illustrates the latest construction of the Hyatt filters, the distinguishing peculiarity of the invention being the simple and effective plan of cleansing the filter bed from the impurities arrested during the filtering process. It is a well demonstrated fact that every filter bed should be entirely cleansed once a day, especially in warm weather, otherwise the organic matter remaining in the filter will decompose, and the water will issue tainted and foul, no matter how bright it may appear to the eye. The facility with which the filter bed in this filter can be washed will be readily understood by the description.

These filters are adapted to the use of sand, coke, animal charcoal, wood charcoal, or other filtering agents. As a rule, a mixture of sand and granulated coke is the most effective filtering medium.

The operation of this filter (cut No. 1) is as follows: The unfiltered water enters by the valve, A, and descending through the filter bed escapes by means of the perforated tubes, B, at the bottom, and the outlet, C. The rapidity with which the water is filtered is a matter of choice within certain limits. As an average rate these filters will purify three gallons per square foot of filtering surface per minute. In some waters a higher speed is consistent with suitable efficiency.

When the filter bed requires washing, the valves, E, in the top of the discharge pipes, D, are opened, and the outlet is closed. The water entering by the supply pipe has then no means of escaping except through the discharge tubes, D.

These tubes are tapering, and extend nearly to the bottom of the filter bed. As the water rushes up through these tubes it carries the filtering material with it, and discharges it through the valves, E, into the upper tank, which is full of water. In this tank the water, as it receives the flow from the filter beneath, effects a complete separation of the impurities that have accumulated in the filter bed, and they flow away with the excess of water through the waste pipe, G. Within five or ten minutes, according to the supply of water, all of the filtering material is thoroughly cleansed and discharged into the upper tank.

Now the filter below contains only water, while the tank contains the cleansed filtering material. To return this to the filter, the supply valve is closed, the discharge valve, F, and the waste valve, H, are opened. Immediately the contents of the upper tank commence descending through the valve, F, the filtering material settling in the filter, and the excess of water escaping through the waste valve, H. In this way the filtering material is speedily returned to the filter, receiving an additional rinsing by the water through which it falls, and settling in the filter clean as new and ready again for work. Then the valves, E, F, and H, are closed, the inlet and outlet valves opened, and filtration is resumed through a completely renovated filter bed. The water used in washing the filtering material being unfiltered will not immediately issue perfectly clear, and it is therefore discharged through the pipe, I, into the upper tank, where it remains for use in the next washing. By the time the tank is filled, the water comes from the filter perfectly clear, when the valve in the pipe, I, is closed, and the filter discharges bright, clear water for consumption.

Experience has shown that by this process repeated as a rule once in twenty-four hours, the filter bed is always in the best possible condition for good work. The washing entails practically no loss of filtering material. The average quantity of water used in cleansing the filter bed is about one per cent of the amount filtered. In filtering Mississippi and Ohio River waters, the filters are washed twice in twenty-four hours, using from three to five per cent of the water supplied to the filter.

Filters, such as are shown in cut No. 2, are worked in gangs or series of from two to ten in number. They are recommended where there is not sufficient vertical space to locate filters having the washing tank on the top, like No. 1. The method of filtering is the same as already described, the water passing in from the inlet pipe, L, and descending through the filter bed, passes out by way of the perforated tubes at the bottom and the valve, A. The distinguishing feature of No. 2 is the manner of washing the filtering material.

These filters are set up in series of two or more, as one of them in its turn contains no filter bed and remains idle while the others are filtering.

For example, in a series of three filters, as shown in the cut No. 2, two of them contain filtering material and may be used simultaneously for filtering, the third standing idle and containing only water. In washing this style of filter, suppose the last in the series of the three to be the idle one, containing only water. The outlet valve, A, in the first filter is closed, the valve, E, at the top is opened, and the waste valve, I, in the third filter is opened. The water coming in through the valve, L, can then only escape through the pipe, E, terminating near the bottom of the filter. Through this pipe the water rushes up into and through the horizontal pipe, H, and discharges into the third filter. In doing so the water carries with it the filtering material from the first filter, discharging it all into the third in about ten minutes. This carrying process is facilitated by a current of water from the upper part of the filter through the small pipe, C, loosening up and helping to separate the impurities from the filtering material during its passage through the pipe, H. As the filtering material and water fall into the third filter, the separated impurities flow out with the excess of water through the open valve, I, into the waste pipe; the filtering material being thoroughly washed, settles and remains in the third filter. Now this washing of the contents of the first filter into the third being accomplished, the valves, C and E, in the first filter, and the waste valve, I, in the third filter are closed. The inlet and outlet valves in the third filter are opened, and filtration proceeds. Next, the middle filter, or number two, may be cleansed, its contents being washed into the first filter precisely as had been done in the preceding case. Following in order, the filtering material in number three is washed into number two in the same way. And so in regular order of succession the filters are cleansed. From one-half to three-quarters of an hour each day is all the time required to keep a series of three in perfect order. And the washing of one filter does not interfere with filtration by its neighbor. It will be observed that with filter No. 1 less water is required in the washing process than in the gang filters, No. 2, because with No. 1 the first water coming from the filter after washing is preserved in the upper tank for use in the succeeding washing; while in No. 2 the first water being unfiltered would be run to waste until it is succeeded by completely filtered water. This, however, is not a serious difference, because within two or three minutes after washing, the filters will deliver perfectly clear water.

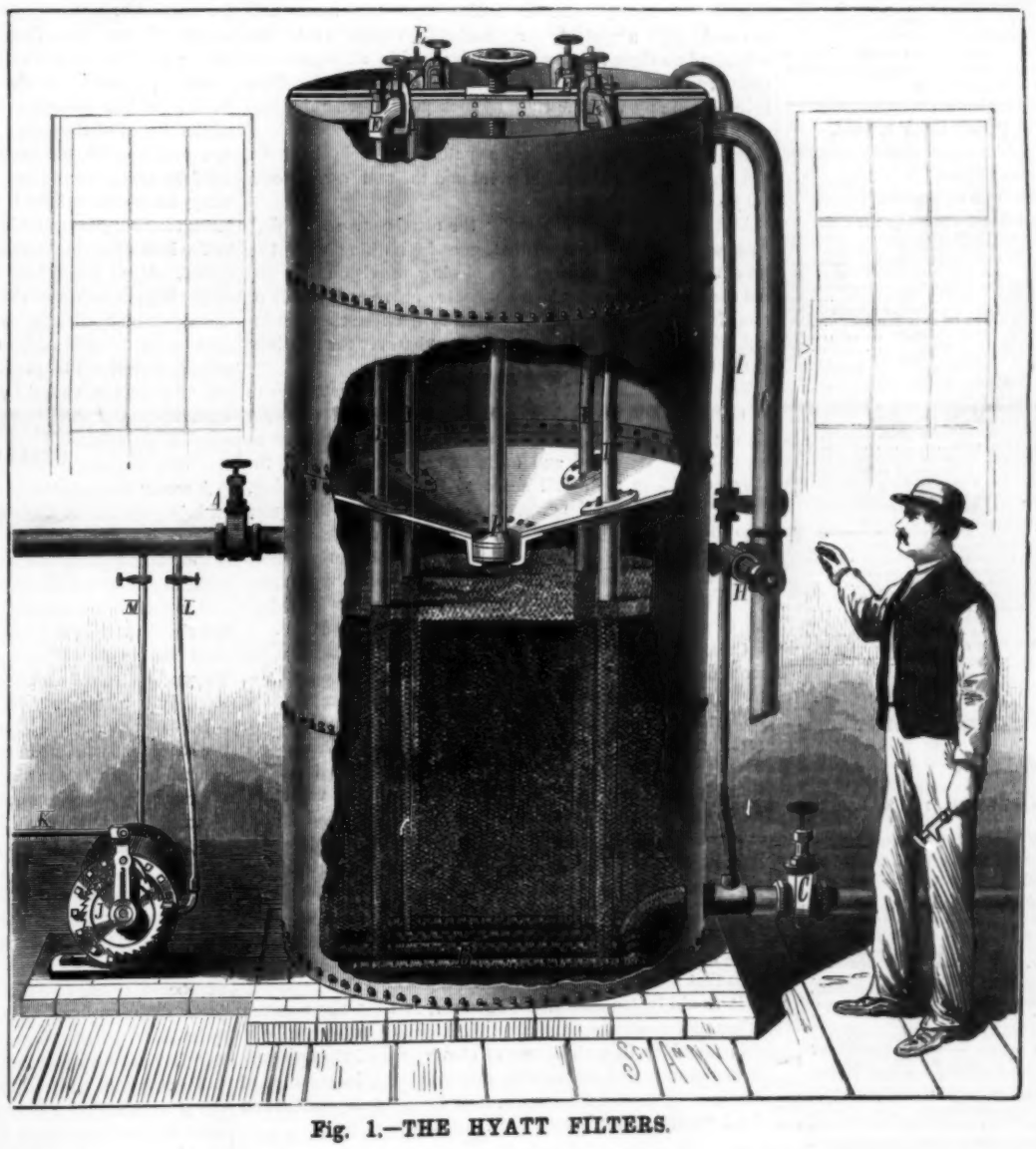

Fig. 1.—THE HYATT FILTERS.

We now come to a highly important part of the subject of water filtration. It is well known that purely mechanical filtration, when applied to such waters as those of the lower Mississippi and other Western rivers, is impracticable for any industrial purpose. There are required such fine filtering media, with the passage of water at so tardy a rate, that large and economical results are out of the question. So many efforts at mechanical cleansing of these waters have been made, and all ending in failure, that the people of the Southern and Western valleys seem to have no faith in any idea of filtration. During the past summer, however, one of the Hyatt filters, eight feet in diameter, which was erected at the pumping station of the New Orleans Water Works Company, filtered the water directly from the Mississippi at the rate of from one hundred to one hundred and fifty gallons per minute, and delivered it as clear as crystal. This was done by a combination of chemical with mechanical means, and at a cost for chemicals of less than one-half a cent per thousand gallons of filtered water. This was accomplished by using in this instance one of the well known agents used for coagulating the impurities in water and precipitating them to the bottom of a reservoir or settling tank.

Alum had been long and extensively used in this way. Many other coagulants had also been used in the same manner, but they all required large reservoirs and considerable time to clarify the water. Perchloride of iron, which is used in connection with the Hyatt filter, has long been known as an excellent coagulant of the principal organic and inorganic matters which pollute and discolor various waters. But wherever it had been used, settling tanks or reservoirs were employed. The perchloride of iron or other coagulant was added to the foul water in certain definite proportions; and after the coagulation and precipitation had been completed, requiring from twelve to twenty-four hours, the

(*Continued on page* 130.)

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ROBBERY AS A BASIS OF PROPERTY RIGHT.

It is commonly believed that the natural tendency of legislation in all civilized countries is toward a reversal of the "good old plan, that he shall take who has the power, and he shall keep who can." And so it is; but unfortunately the tendency is not universal. Under the specious plea of correcting alleged wrongs, it is still possible for legislators, presumably civilized, to propose (if not to secure) the enactment of laws which do not help to make it easier for men to retain and enjoy what is rightfully theirs. Nevertheless, one cannot but feel a degree of surprise at the sight of legislators calmly considering acts which would put a premium upon robbery, by making it impossible for the owner of any species of property to reclaim it after it had been taken from him by force or fraud; and that is precisely what is aimed at in bill No. 1,558, now before the Senate.

This is a strong assertion, yet the facts will bear it out; for the bill frankly discriminates in favor of the receiver of (admittedly) stolen property against the claims of the real owner.

The bill in question was introduced Feb. 16, by the Hon. D. W. Voorhees, Senator from Indiana, as a substitute for the bill (S. 1,115) to amend Section 4,919 of the Revised Statutes relating to the recovery of damages for the infringement of patents, the text of which is nearly the same as House bill 3,925, printed in the SCIENTIFIC AMERICAN for February 2, 1884. The proposed substitute reads as follows:

"*Be it enacted, etc.*—That it shall be a valid defense to any action for an infringement of any patent, or any suit or proceeding to enjoin any person from the use of a patented article, that the defendant therein, or his assignor, purchased the patented article for use or consumption, and not for sale or exchange, in good faith and in the usual course of trade, without notice that the same was covered by a patent, or without notice that the seller had no right to sell such article: and in all such cases notice received after such purchase shall not have the effect to impair in any way the right of such purchaser as absolute owner."

In brief, though the seller of a patented article have no right to sell, the sale shall be valid and the real owner cannot reclaim his property.

All the talk of "good faith," "the usual course of trade," "for personal use," and all that, goes for nothing, except to cover the naked injustice of the closing provision. In not one case in a million could the patentee prove an absence of good faith or the existence of collusion between the fraudulent seller and the "innocent" buyer, whatever the relations of the two might be.

The courts have held the property rights of patentees to be as sacred and inviolable as any other species of property rights; and public interest demands that they shall be as scrupulously respected and quite as carefully guarded, for they contribute their full share to the public well-being. Exact figures cannot be given; but any one who will inquire into the value of property vested in, or contingent upon, patent rights on New York Island alone—property whose value would be unsettled or destroyed outright by the proposed legislation—will soon arrive at a sum that would go far to purchase the entire farm property of whole States.

On the score of sound policy, not less than that of common justice to inventors and patentees, Congress ought not to play fast and loose with interests so gigantic and vitally important. The public injury might be more readily apparent, but it could scarcely be greater, if cattle, or horses, or houses, or lands were similarly deprived of legal protection, by enabling any thief or trespasser to give a valid title to any one he might induce to buy of him in "good faith."

If the spirit of the proposed bill were not so plainly in harmony with that of other bills, on this and other subjects, proposed or enacted by the present Congress, one would be almost forced to think that its purpose must be not to secure a change in the cited section of the Revised Statutes, but rather to expose the inherent viciousness of other patent bills that seek, though less frankly, the same end.

It would be too hazardous, however, to treat the measure other than seriously, in view of the manifest temper of certain members in both houses of Congress, and the apparent inacquaintance of others with respect to the importance of our manufacturing interests or their intimate dependence on the integrity of the patent laws.

LOOSE PULLEYS, OR IDLERS.

The common practice of running a loose pulley on the shaft, as a wagon wheel runs on its axle, is one full of annoyances and is anything but a permanency in use. A loose pulley, or an idler pulley, should have its separate shaft with its separate journals. The shaft upon which the fast pulley is fixed is of too small a diameter to act as the axle for a pulley which revolves rapidly, and the hub of the pulley is too short to withstand the leverage strain of the broad rim, particularly when this strain is intensified by that of a long, heavy belt. The better practice, wherever it is feasible, is to mount the idler pulley on a short independent shaft with its own independent journals. One of these journals may turn in a projecting portion of the hub of the fast pulley, so that the rims of the two pulleys may come together, or the idler shaft may be supported by two boxes outside the loose pulley.

With this arrangement there is no pulley turning on a shaft and "wabbling" from side to side by the unequal and changing pull of the belt, making a wear that will insure a rattling.

Another device is practiced by a first class mechanic, which is to substitute the turned hub of the fixed pulley for the shaft as an axle for the loose pulley. The result of this method is to give a large bearing for the loose pulley hub. To accomplish this result the fast pulley is cast with the rim entirely on one side of the arms and the hub extending beyond the other side of the arms sufficient to receive the hub of the loose pulley its entire length, while the rim and hub of the loose pulley project from the same side of the arms of the loose pulley. This arrangement gives a very large bearing for the loose pulley hub—the outside of the finished fast pulley hub—and also saves the width of one pulley in the projecting end of the shaft, as it need come no further through the box than to receive the hub of the tight pulley.

In all cases it is a good plan to have the loose pulley slightly smaller in diameter than the fast pulley, to relieve the tension of the belt; and when the fast pulley is slightly larger, it will receive the belt and start the work more readily.

HOW KNURLS ARE MADE.

Knurls may be purchased ready made and of varying sizes and patterns at the tool stores, but it not unfrequently happens that these stores are not at hand or that their stocks are too limited for choice. But knurls of the ordinary cross flutings, for use for knurling thumb nuts and screw heads, may be readily produced on the lathe with the help of the ordinary screw chasing hob. To do this turn up the blank knurl, of soft iron or annealed steel, drill it, and mount it as usual in its handle, so that it turns freely on its pivot; place the hob on the lathe centers, dogged to the face plate, as usual. Place a lathe tool or bar of steel in the tool post for a guide or rest, and present the knurl on its side so that its pivot is vertical. Bear against the hob as for forming a chaser, and the threads of the hob will rotate the knurl as the cutting proceeds. If the knurl lies square on its side, the flutings will be slashed at the same inclination as the pitch of the thread of the hob. Should a greater slash be desired, or no slash at all, the result may be produced by inclining the face of the knurl, and this inclination can be assured by filing its handle where it rests on the guide. If the knurl has a rounding face, the inclinations at which it is presented to the hob must be changed as the work proceeds, to correspond. If the knurl is to have a concave face, the concavity of the knurl's face and the diameter of the hob must correspond. Good soft iron, as Swede or Norway iron properly case hardened, will make as good knurls for brass or softer metals as steel. The grades of fluting of knurls produced in this way may be varied by using hobs of different pitches of threads.

TETANUS—LOCK JAW.

A recent correspondent inquires "How many days after an injury to toes or fingers is lock jaw likely to set in, and after how many days may the danger be considered past?" A disease involving such extreme peril as tetanus is very naturally viewed with proportional horror and apprehension, and instead of answering our correspondent in "Notes and Queries," we devote a little space to the subject here; and we shall confine ourselves, as he does, to that form of disease known in surgical practice as traumatic tetanus, as that is the only one popularly recognized.

It is well to correct at once an impression which is very common and which causes much needless alarm. It is the general belief that a severe, and especially a lacerated, wound is extremely apt to cause lock jaw; a hurt, for instance, from a "rusty nail." Now, this not at all true. It will, by most people, be deemed very strange, but it still is strictly true, that tetanus has very little to do with the severity of the injury; a single smooth cut (for example, a slight surgical operation) may cause it, as may also a blow even of no great violence. On the other hand, the most terrible mangling and tearing may go free. And so extremely small is the number of cases, in comparison with the multitudes of injuries daily received, that every effort ought to be made to quiet the popular apprehension. Cases of tetanus do occur, but they are very few in their sum total.

There can be no question that the physical condition of the person injured has much more to do with the development of the disease than has the severity of the injury. Except in special localities, it is almost impossible to induce tetanus in a person who is in good, vigorous health. Depressing causes of every sort tend to its origination, and hence the well known fact that injuries and surgical operations during the exhaustion of a severe military campaign develop tetanus at a very alarming rate. The disease is purely nervous in its origin and its nature, and because of this whatever lowers the nerve force, that is, the life force, favors its inception. But though nervous only at first, organic changes in blood vessels (and probably also in the blood) as well as other tissues speedily follow, and these then play their own destructive part.

Tetanus may follow an injury almost instantly, certainly within an hour, though this is not common, and it may be delayed several weeks. Instances are on record where it has waited a full month, but this is also not common. From the third day to the tenth is the range in general. After the tenth day few cases occur, and even if they do, the danger is not so great, for they are milder in proportion to the lateness of their origin, and many such recover. Of those beginning early the prognosis is frightfully unfavorable.

Some writers even go so far as to say that "it is doubtful if there be any authentic case of recovery under such circumstances," but this is certainly not true, as we have personal evidence to prove recovery is possible.

The treatment must of course be left to the best skill to be obtained in the emergency. Opium in very large doses, together with proper care of the wound, is about all that would lie within the reach of a non-professional person. Chloroform or ether might be inhaled, by means of a napkin or sponge, to check the violence of spasms, but their effect is quite transitory, and to be of any real efficiency must be pressed more urgently than any one but a person thoroughly trained would be likely to do.

PATENT BILLS IN CONGRESS.

To the Editor of the Scientific American:

Noting in issue of Feb. 2 the short article, "A Bill to Reduce the Lifetime of a Patent to Five Years," as comment upon H. R. 3,617, introduced by our own representative, the Hon. Jno. A. Anderson, I was the more fully impressed with the growing importance of this most frantic and insane cry of the general public against the patent laws, and begin to feel the necessity of inventors and all others interested in the advancement of the arts and sciences doing something. The trouble lies in the fact that those who should be most interested in having wholesome and just patent legislation for their own protection and that of the general public really give the least attention to it. We leave these vital and all important matters to our legislators and senators, who as a rule do not come from the class fully knowing the needs of the case, and thus we have imperfect laws upon the subject; and under the press, as at present, of popular excitement and indignation on part of farmers and the public generally against so many recent patent frauds, patent abuses, and royalty jumpers, especially in the West, we are liable to have some serious mistakes made, and our patent system partially if not wholly crippled, by hasty and inconsiderate amendments under these circumstances. And the matter coming so close home as to have my own townsman introduce so objectionable a bill, I feel that it at once behooves those interested to wake up and see if there is not really some cause for dissatisfaction, and if so what it is; and to suggest from a just and mechanical standpoint some reasonable remedies. And in pursuance of such motive I desire to do my little share. It suggests itself to me, and has for a long time, that our present laws are all right so far as they go, but are by no means sufficient to fully protect both the inventor and the general public. The original intent and purpose of our laws was evidently to protect the inventor, that is, to pay him for his work and study; and for the free publication to the world, the result of his work and study, he should be protected for 17 years in the exclusive use, etc., of his invention. But as our country grows broader, and varied interests more developed, we find the general public requiring some protection as well. Now, how can it be arranged that the inventor shall be fully and amply protected in his rights, and at same time the general public not be put to great annoyance and inconvenience? Certain it is our present laws do not do this; and further, the interests of the public are generally paramount to those of the individual.

But let us see. The policy of our system is to regard the rights of the inventor as what is termed *property*, *i. e.*, that which can be *bought* and *sold*—something that can be made the subject of ownership and personal control. Now, a horse is property and is so regarded; is capable of being sold, and also of being *stolen*. When any one appropriates to his own use another's horse, he steals—is a thief—and the law says he shall be tried as a *criminal* for a *crime* against the *law*, *not against* the individual, and on conviction shall be punished by fine and imprisonment. It is not so with a patent, or rather with rights conferred by the patent laws. Why should it not be? Again, if a man falsely and knowingly represents himself to own or control property which he does not, thus interfering and injuring the rights of others and the public, he is a criminal. Therefore *my* suggestion as a remedy for most of the evils, I think, of our present system would be to place the right of property under patents upon same footing as other property rights, and would call for legislation making it a criminal offense, punishable by fine and imprisonment, for any one to willfully and knowingly make use or vend any article or process upon which a valid patent existed, and would further make it a criminal offense for any one to claim rights protected by letters patent willfully and knowingly (thus preventing the public use of such article), unless he really had a valid existing patent.

And to simplify doubtful cases, it would be well to arrange a means for knowing promptly whether a claim made by any one to patent rights was valid or not by a *writ of inquiry* instituted before a proper court provided for the case.

This seems to me a more tangible means of correcting abuses of our patent laws than any other way, for in no way can we better protect the rights of property in anything, whether it be an invention or a horse, than by making the appropriation or wrongful use of such property a criminal offense. Whether this is the *best* course or not, we must see; but I am convinced of one thing, and it is that the mechanical world must take hold of this question and have some voice in the matter, or there is grave danger of a complete nullification of the very system which has done most for our country during the last fifty years.

SAM. KEMBLE, JR.

Manhattan, Kansas, Feb. 4, 1884.

[Our correspondent is well known as an enterprising manufacturer and inventor. The grant to him of patents for his inventions has enabled him to introduce and put into successful operation an improved industry, thus giving employment to many persons and contributing to the prosperity of his town and State. In the same manner, by the efforts of inventors, fostered by the patent laws, thousands upon thousands of industries have been established in all parts of the country; and as a result the United States is to-day probably the most prosperous nation in the world. Her agricultural products have reached enormous proportions, owing chiefly to the labor saving machinery which patentees have studied out and supplied to the farmers.

In view of such considerations, it seems almost like an insult to the common sense of the nation for honorable members of the House to declaim against the patent laws and strive to pass enactments that will cripple and destroy industries created by those laws. Think of the votes given in the House January 21, in favor of the passage of bill H. R. 3,934, which forbids the inventor from recovering damages for the use of his patent—114 ayes, 6 noes, 200 members not voting; and not a single man with pluck enough to stand up and breathe a word in behalf of his constituents, whose property and rights were by the enactment of the bill sure to be injured. The inventors, workers, and manufacturers of this country are strong enough to have not only one but many representatives of their interests in Congress; at present they have none—none but dumbheads. With a little unity of effort to see that no man is hereafter elected who will not pledge himself in advance to the encouragement of home industries and home inventions, there will be a different spirit exhibited in Congress; and inventive manufacturers like Mr. Kemble will not be obliged publicly to complain of their townsmen in Congress for introducing foolish bills.

Because there are thieves abroad who try to steal property is no reason why Congress should pass laws to prevent honest people from owning or defending property.]

FIRE DAMP EXPLOSIONS.

The Pennsylvania coal regions near Uniontown have again been the scene of terrible loss of life from fire damp explosion, by which nineteen men were lost on February 20th. Despite the fact that the "fire-boss" had made his usual inspection the night before and pronounced the mine safe, events nevertheless showed that such was not the case. The accident, on the face, seems to have been the result of over-confidence, since it appears that the inspection was made about 12 hours before the accident occurred. The mine had always been considered as a "safe" one, which no doubt accounts for the laxity in examination. But it nevertheless points to the fact that even the safest coal mines need constant watching to prevent accidents of this sort. Nor does it appear that any of the appliances for automatically showing the existence of fire-damp were in use. It would be unfair to single out this particular mine as being derelict in that respect, since hundreds of others are similarly unprovided; but that does not alter the fact that they ought *all* to be provided with apparatus for automatically announcing the presence of fire-damp, of the mere existence of which some mine owners seem to be in total ignorance.

Methanometers, as such instruments are called, have been devised, depending both on the physical and chemical qualities of the dangerous gases which occur in mines, and although they have not yet come into extended use, there is no reason why they should not. Mine owners may object to the score of expense, but the loss incurred by a single disaster might many times overbalance the cost of installing a system of fire damp detecters.

FIRST STEAM FIRE ENGINE.

To the Editor of the Scientific American:

On page 102 of the current volume of the SCIENTIFIC AMERICAN appeared a short article under the above title, in which you say, "We believe the first steam fire engine was tried in New York in 1842." You are nearly correct.

The alarming frequency and extent of fires in the city of New York during the winter of 1839–40 caused the attention of the citizens generally, and of the insurance companies in particular, to be directed to the subject of providing more efficient means for extinguishing fires than then existed.

At the suggestion of the underwriters, Paul Hodge, a machinist in this city, constructed a steam fire engine which was publicly tested in front of the City Hall late in a fine afternoon in March, 1841. It was a failure, as was demonstrated at the fire in the building of Harper Brothers in 1842.

Meanwhile the Mechanics' Institute of the City of New York had moved in the matter. In the spring of 1840 its board of directors (of which I was a member) offered its gold medal, the highest honor within its gift, as a reward for the best method for applying steam to the propulsion of the fire engine. The reward was won by the now venerable engineer and inventor Captain John Ericsson, before midsummer that year. The Committee on Arts and Sciences of the Institute, after a careful examination of several plans and specifications offered, made an elaborate report in favor of the one presented by Ericsson. In that report was the following paragraph:

"The points of excellence as thus narrowed down were found to belong in a superior degree to an engine weighing less than two and a half tons that, with the lowest estimate of speed, has a power of 108 men, and will throw 3,000 lb. of water per minute to a height of 105 feet though a nozzle 1¼ inches in diameter. By increasing the speed to the greatest limit easily and safely attainable, the quantity of water thrown may be much augmented."

Captain Ericsson had presented a beautiful drawing of his engine and several illustrations descriptive of its structure. His letter accompanying the drawings and specifications is dated July 1, 1840. At that time the late Professor James J. Mapes was conducting the *American Repertory of Arts and Science*. I reduced for him to the size of his paper (octavo) the drawings of Captain Ericsson, and engraved them. These appeared in the *Repertory* for October, 1840, with full descriptions by the inventor. In November, the same year, these engravings and the descriptions appeared in the (illustrated) *Family Magazine*, published by Justus S. Redfield, of which I was then editor and illustrator. They appear on pages 224–226 of the eighth volume of that work.

Mr. Hodge's steam fire engine, which appeared very much like a locomotive as I saw it at work in front of the City Hall, was finally bought by a packing-box manufacturer, who used it as a stationary engine.

"The introduction of the steam fire engine into the city of New York," says Mr. Sheldon in his "Story of the Volunteer Fire Department," was delayed several years through the opposition of the volunteer firemen, who had the foresight to recognize it as their most formidable foe." If three or four men can handle a machine," they said, "what is the use of having sixty men and numberless assistants to do the same work?"

BENSON J. LOSSING.

The Ridge, Feb. 16, 1884.

BEE CULTURE.

To the Editor of the Scientific American:

In the SCIENTIFIC AMERICAN for February 2 is an article taken from an Australian paper on "Bee Farming in New South Wales." As a practical apiarist of some twenty years' experience, I have come to the conclusion, after reading the above mentioned article carefully, that our system of bee culture in Canada and the United States is considerably ahead of the Australian system as applied on the "bee farm" spoken of, and also of the German system of which it is said to be a copy.

In the first place, our styles of movable frame hives are evidently superior to theirs. The frame which the German holds in his hand in the illustration is a clumsy looking affair, and would be promptly discarded as such by any first class Canadian or American bee keeper. It is without bearings, and without the half inch bottom-piece projections which so much facilitate the handling of the frame, and effectually prevent the crushing of odd bees in taking out and putting in. The hive they use is evidently as unwieldy and clumsy as the frame that belongs to it.

And what American bee keeper wouldn't smile at that "swarming bag" as "a great improvement"! Just imagine an apiary of say 100 colonies depending upon the "swarming bag," or a score of them, during the swarming season! The whole twenty bags with twenty men behind them would do but small business under such circumstances; whereas, in our system of queen "clipping" and judicious manipulation, two or three expert hands can attend to that number.

And, then, instead of having a convenient little hand smoker by his side, like us, he smokes his pipe to mollify the bees. The tobacco pipe is no necessary part of bee culture, and the teaching that it is, is bad moral precept as well as bad science.

This writer says: "When the queen bee hatches out of the cell, she makes a flight (the only flight of her life) in order to meet a drone or male bee."

This statement is erroneous, as every scientific apiarist knows. A few days after the young queen is hatched (usually from three to eight days after) she goes out for a flight, it is true; but if she fails during the first flight to meet the drone and become impregnated—as frequently happens—she repeats her flights until that condition is secured. Nor is that successful flight the last natural "flight of her life" by any means. She leads the first swarm from her hive, and repeats this every year, and sometimes twice a year, as long as she lives.

Quite true it is that the queen's wings may be clipped immediately after she becomes impregnated, to prevent her from all subsequent flying, but in such cases she is under the manipulation of the bee keeper in making his swarms *artificially*. The queen bee, in her natural state, flies first to be impregnated, and subsequently flies with every first swarm until she dies naturally or is superseded by the workers when she becomes unprolific.

ALLEN PRINGLE.

Selby, Ontario, February 14, 1884.

Limbs of Unequal Length.

A writer in *Nature*, a member of the Royal College of Surgeons, mentions that, of seventy well authenticated skeletons he examined, the lower limbs were equal in length in only seven instances, the right limb being longer in twenty-five and the left limb in thirty-eight cases. It is claimed that this will have the effect, where persons walk without knowing the direction from their surroundings, to make their step longer with one limb than the other, and thus travel in a circle, as people so frequently do when they get lost. In most of the skeletons above referred to the right arm was longer than the left.

THE HYATT FILTERS.—MANUFACTURED BY THE NEWARK FILTERING CO., NEWARK, N. J.

(*Continued from first page.*)

resulting clear water was decanted or siphoned off from the precipitated impurities.

Afterward these impurities were disposed of by flushing, or in some way washing the reservoirs. This was not, however, found entirely satisfactory. The process employed in connection with the Hyatt filter consists of a supplementary apparatus, by means of which the requisite quantity of the coagulant is injected into the unfiltered water in its passage to the filter. The coagulant is almost instantaneous in its operation; but the precipitation of the coagulated impurities is necessarily slow when used in a reservoir, as they descend to the bottom only by the force of gravity. With the filter, however, precipitation is of no consequence, the filter bed immediately arresting the coagulated impurities and transmitting bright, clear water without delay. An interesting fact, also, is that less than one-half the proportion of coagulant is required when used with immediate mechanical filtration.

This apparatus for injecting the coagulant will be seen by the side of the filter in the illustration No. 1. From the supply pipe, A, the pipe, M, connects with one end of the cylinder of the injector. Within this cylinder is a piston, the water from the pipe, M, pressing against one side of the piston. In the cylinder on the other side of the piston is the coagulant in solution. From this other side the coagulant passes through the rubber hose, L, into the pipe, A, where, commingling with the water during its passage into the filter, it performs its office of coagulating the impurities in the water, the impurities being arrested during the passage of the water through the filter.

It will be observed that the pressure from the pipe, A, will be equal on each side of the piston in the injecting cylinder, by virtue of the connecting pipes, M and L, and that without some other application of force the injector would remain at rest. But as a definite proportion of the coagulant to the unfiltered water should be supplied, this is effected by communicating the proper motion to the piston within the cylinder. This is accomplished by means of the connecting rod, K, which propels the ratchet wheel, J, and moves the piston by a screw.

This connecting rod, K, is operated either by a water meter propelled by the filtered water, or by the pump which supplies the filter. It is so regulated that the rate of supply of the coagulant will bear a proper ratio to that of the supply of water to the filter. When perchloride of iron is used, the consumption will be one part of this material to from thirty thousand to sixty thousand parts of Mississippi River water, according to its state of impurity. The injecting cylinder has a capacity of at least twenty-four hours' supply of the coagulant. To supply the coagulating solution at the proper rate, the piston of the cylinder is propelled by the means indicated at the requisite speed.

The lining of the injecting cylinder is made of a substance that is not corroded by the coagulating material. No part of the coagulant passes through the filter with the clear water.

It combines with the impurities, and with them is arrested by the filter bed and periodically washed away. Preparations of iron or of lime are well known to be absolutely harmless, in a sanitary point of view in any event.

This method of purifying such water as the Mississippi is going into extensive and successful use in New Orleans and upon Louisiana sugar plantations.

The Hyatt filters and the processes here described are the subject of several patents in the United States, Canada, and principal European countries. Either of these described filters is adapted to the purification of river, pond, or lake water in any quantities, and in all situations and under any pressure, the coagulant being used only where the character of the water is such that mechanical filtration alone is not effective.

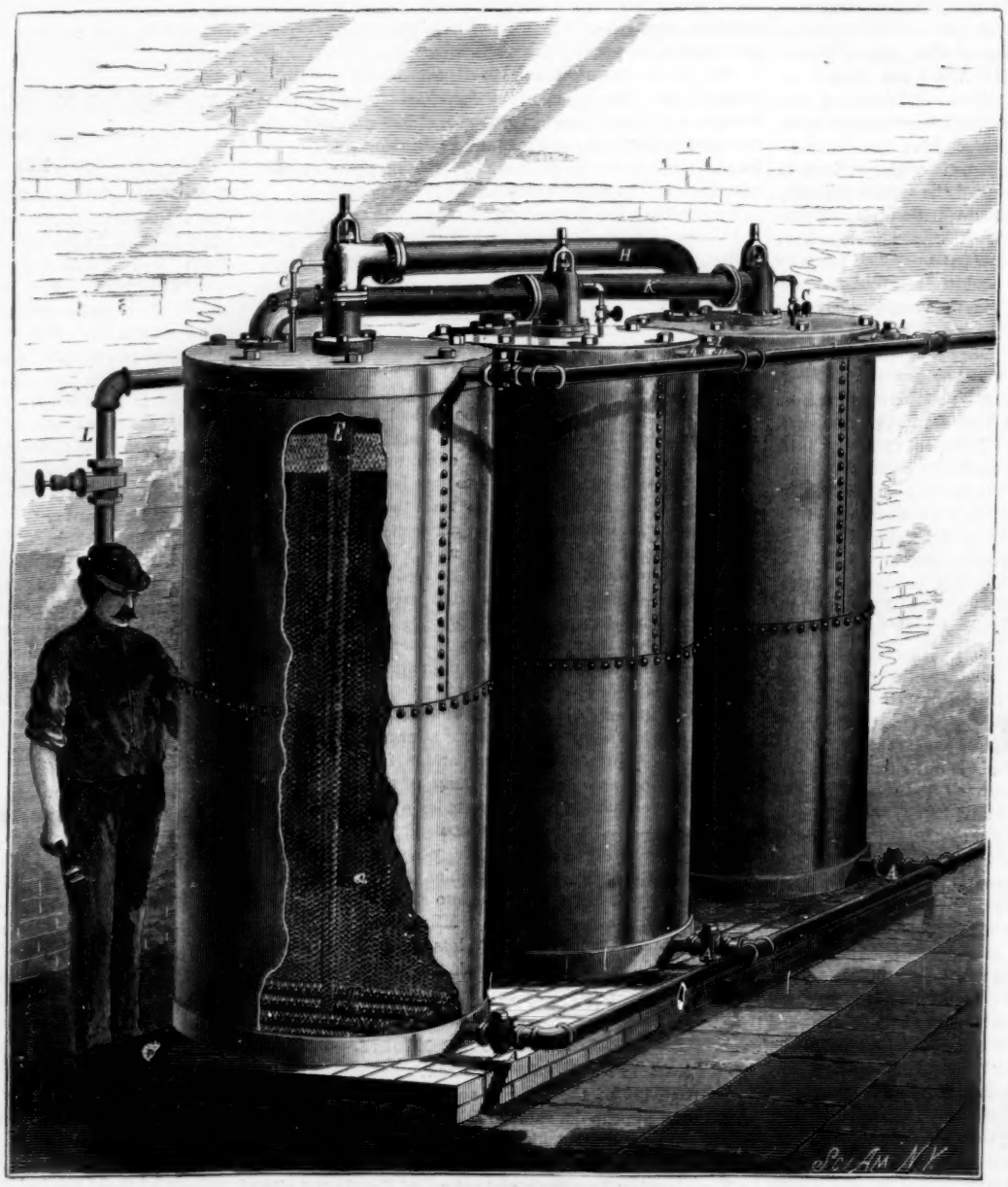


Fig. 2.—THE HYATT FILTERS.

The Sewing Machine Industry.

A contemporary has been looking up the origin of the sewing machine, and collating facts relative to the extent of its present manufacture.

Forty-six years ago, on February 21, 1842, says the writer, J. J. Greenough took out the first United States patent on a sewing machine, according to the patent records as they now stand. Lye's machine was patented in 1827, but as the patent records of that year were burned, it is not known what were its claims. The first sewing machine in the world, intended rather for embroidering than plain sewing, was patented in 1755. The next machines in order of time were Thomas Saint's, English (1790); Duncan's, English (1804); Rev. J. A. Dodge's, American (1818), not patented on account of the bitter opposition of the tailors; Thimonnier's, French (1830); and after some modifications was patented in the United States in 1850. This was the first machine to come into practical use. Thimonnier was mobbed by the tailors and barely escaped being killed. He died in poverty in 1857. Then came Walter Hunt's, American, 1832. He neglected to patent his invention. Elias Howe's machine was patented in 1846; A. B. Wilson's, 1849; I. M. Singer's, 1851; Grover & Baker's, 1851; the Weed, Finkle & Lyon and Parham, 1854; the Florence, 1855. From 1857 to the present day but few new machines have been patented, the principal ones being the Willcox & Gibbs, the Empire, the Ætna, the Domestic, and the Victor. In all, since 1846, over two thousand patents have been issued on sewing machines and their different parts and on sewing machine attachments. The machines are best classed by the kind of stitch produced. Four-fifths of all the machines now made use the lock-stitch. In the United States to-day, according to the last census, there are 106 sewing machine establishments, with an invested capital of $12,501,830, employing 9,283 persons, to whom are annually paid in wages $4,636,099. The value of materials used is figured at $4,829,106, and the value of the products at $13,863,188. Sixteen States monopolize these manufactures. Over half of the invested capital, and fully one-half of the value of the products, are centered in the States of New Jersey and Connecticut. Not more than three or four concerns in the country extend their operations over the whole range of work on a sewing machine, including case making and needle making. In some cases, however, the management covers the wide range from the ownership of forests and getting out raw material to extensive transportation facilities and ramifications of agencies for marketing the product throughout the world. The operations in sewing machine manufacture are many and varied, entailing in the turning out of a machine the aid of wood working, foundry work, machinery, forging, tool making, needle making. Besides these are numerous other details, such as japanning, boxing and box making, testing, teaming, porterage, and common labor.

"Taking Aim"—Two Eyes or One?

Quite a lively discussion is said to be taking place in England as to whether a marksman generally takes aim with both eyes or one in rifle shooting. Those who consider that one eye alone is used endeavor to prove their case thus: Hold, they say, a ruler before the right eye in such a position that when the left eye is closed it covers the object; now shut the right eye, and see in which direction the ruler points; it will be found to be many inches, or feet, or yards away to the right, according to the distance of the object. It is therefore obvious, so the argument runs, that a man fixes the object, bird, or target, as the case may be, with his right eye, and neglects the image formed on his left retina altogether. The difference of opinion upon the subject depends, according to the *Lancet*, on the different practice of aiming adopted by different sportsmen. If a man shoots slowly, accommodates his eye to the sight or sights on the barrel of his gun, and then relaxes his accommodation for the distant object, and still more if he alternately exerts and relaxes his accommodation, for which there is ample time in target or any other deliberate shooting, then undoubtedly he uses one eye, and, of course, usually the right eye, alone. But the act of accommodation is a slow process, it requires nearly, if not quite, a second, and in ordinary bird-fowling the sportsman has no time for this. The more practiced he is the less he attends to his barrel and his sights. He first fixes the object with both eyes, and then points the barrel at the precise elevation and in the direction which long experience has taught him will be effective when the gun is discharged. He adapts his eyes for the distant object, and the rest is mechanical. Corroborative evidence that this view is correct is afforded by the fact that the bowler at cricket never closes one eye or troubles himself about any line. He simply fixes the wicket or the precise spot in front of the wicket on which he desires to pitch the ball, and leaves the rest to the coordinating nervous centers. The billiard player, again, in the vast majority of cases uses both eyes, and fixes alternately the near and the distant ball with both eyes. Therefore, if a man uses his sights and attends to his barrel as well as to the object, he employs one eye only, neglecting the impressions derived from the other. If, however, as is customary with experienced sportsmen, he takes no thought of his gun and fixes the distant object, then, undoubtedly, unless he has some defect of vision, he uses both his eyes, the visual lines of which at thirty yards are almost parallel to each other.

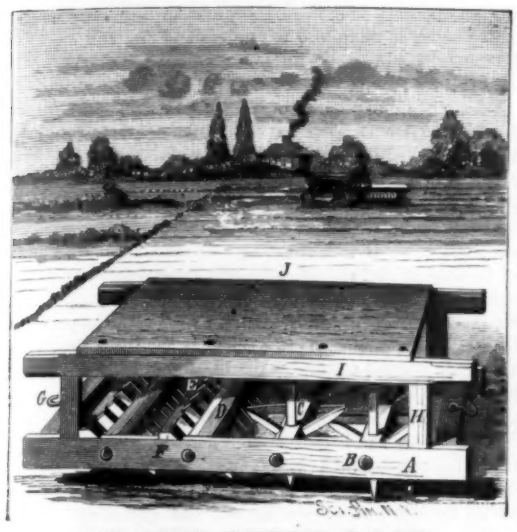
Butterine vs. Butter.

There is a good deal of butterine made and sold in Europe, and there, as here, people seem to have little apprehension how extensively it is used. The *Farmer's Gazette*, of Dublin, publishes a statement showing how difficult it is for ordinary judges to tell butter from butterine. Some fine Normandy butter, costing 48 cents a pound, and a sample of butterine, bought of a local retailer for 22 cents a pound, were submitted to a jury of nineteen farmers, who tasted and examined both samples. Ten out of these nineteen judges declared the butterine to be the butter. The makers of butterine in this country use all the way from 60 to 85 parts of neutral lard to 40 and 15 parts of good butter, respectively, in making butterine. These are thoroughly mixed, salted, and colored a golden yellow, and the tubs are branded with fancy names as from country creameries.

It is said an infallible test is to melt the butterine and then suddenly chill it by surrounding it with cracked ice, when the lard goes to the bottom and the butter to the top, the line of separation being plainly visible.

IMPROVED REVOLVING HARROW.

In bearings in the side bars, A, of the frame of the harrow revolve the journals, B, of four octagonal rollers, the two rear ones of which are provided with teeth passing through them and projecting upon the opposite sides. The teeth are arranged in spiral form, and may be varied by inserting the first tooth in the center of one roller and running the spirals in the same direction toward each end, forming a right and left spiral. In the other roller the spiral may be run in the same direction from one end to the other, the teeth of one roller being so arranged that they will pass between the teeth of the other. With this construction the teeth of one roller will clear the teeth of the other of grass,



McCLELLAND'S REVOLVING HARROW.

weeds, etc., the rollers being revolved by the contact of the teeth with the ground.

The remaining rollers, D, are furnished with knives, arranged in rows, the shanks of which pass through the rollers and project far enough to strike against the cross bars, F, which are so placed as to hold the knives at the desired inclination. The lower parts of the knives are made with edges upon their front and rear sides, so that they can be kept sharp by drawing the harrow first in one direction and then in the other.

The rolling and rigid knives are designed for use in cutting in pieces sods, clods, and lumps. When the soil is free from lumps, the knife rollers can be replaced by toothed rollers. A platform for the driver to stand or sit upon is supported by standards above the rollers. This platform can be used as a receptacle for loose stones, stumps, etc. The rollers are journaled in the side bars in such positions that their lower sides are flush with the lower sides of the bars, so that when the harrow is at work they will roll upon the surface of the soil, keeping it smooth and level.

This invention has been patented by Mr. Thomas McClelland, of Waynesboro, Pa.

Exporting American Locomotives.

The *Colliery Guardian*, of London, in noticing that the Baldwin Locomotive Works, of Philadelphia, in 1883, made 557 locomotives, of which 150 were exported, doubts the possibility of much increasing American trade in this direction. Our contemporary alludes to some of the advantages of our locomotives, from their flexibility, for use in new countries, where the roadbed is less solid and massive than it usually is in Europe; but it claims that the very bigness of our country is against us in the competition with English locomotive builders, because there the coal, iron, and labor are concentrated in small limits, and shipping facilities extend to the very doors of the factories. The implication is that here the materials for such work have to be hauled great distances. But the fact is that in many cases there is in this country no greater transportation of material from the coal and iron mines to the placing on board ship of the finished product than there is in England itself.

Cementing Brass on Glass.

Puscher recommends a resin soap for this purpose, made by boiling 1 part of caustic soda, 3 parts of colophonium (resin) in 5 parts of water, and kneading into it half the quantity of plaster of Paris. This cement is useful for fastening the brass top on glass lamps, as it is very strong, is not acted upon by petroleum, bears heat very well, and hardens in one-half or three-quarters of an hour.

By substituting zinc white, white lead, or air-slaked lime for plaster of Paris, it hardens more slowly. Water only attacks the surface of this cement.

Wiederhold recommends, for the same purpose, a fusible metal, composed of 4 parts lead, 2 parts tin, and 2½ parts bismuth, which melts at 212° Fahr. The melted metal is poured into the capsule, the glass pressed into it, and then allowed to cool slowly in a warm place.—*Polyt. Notizblatt.*

Action of Copper upon the Human Economy.

MM. A. Hules and De Pietra-Santa.—The authors give an account of Durfort, a village of Tarn, where the workmen pass twelve hours daily in the midst of an atmosphere of copper oxide. Their skins, hair, and beards are colored with copper. The same metal can be detected in their secretions and excretions, and, after death, in their bones. These people suffer from no special trade disease, and on the other hand they enjoy no special immunity from infectious diseases, and in particular from cholera or typhoid fever.

IMPROVED SAFETY SWITCH GUARD.

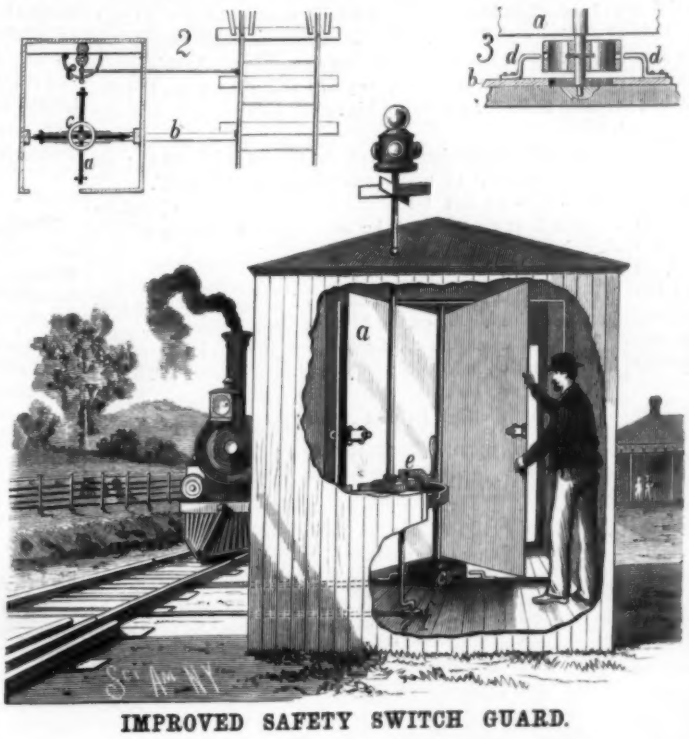
In the invention herewith illustrated the house which is erected over the switch lever is only large enough to permit the switchman to enter, and when inside, to move the switch lever. The egress of the switchman from the house, as long as the switch is open and disconnected from the main line, is prevented by a turnstile carried by a vertical shaft in the central portion of the house. Near the bottom of this shaft and revolving with it is a horizontal wheel, *c*, Fig. 2, containing holes corresponding in position with the doors of the turnstile above. (Fig. 2 is a plan view of the device. Fig. 3 is a vertical transverse section through the turnstile, and the large view shows the switch and house, part of which is broken away to show the interior.)

Connected with the switch is a slide bar, *b*, that is worked by the switch lever, and that is provided with two arms or bolts, *d d*, one of which enters one of the holes in the wheel, *c*, when the switch is opened, and cannot be withdrawn until the switch is closed and reconnected with the main line. So long as the arm on the slide bar remains in the hole in the wheel, *c*, the vertical shaft and the turnstile are immovable.

But when the slide bar is withdrawn, which can only be done by closing the switch—that is, reconnecting it with the main line—then the wheel, shaft, and turnstile are at liberty to revolve, thereby permitting ingress and egress. The slide bar, *b*, is worked by the switch lever, *e*; the construction of these parts will be readily understood from the engraving. When the switch is in connection with the main line, as in Fig. 2, the bar, *b*, is in the position shown in Fig. 3, both bolts, *d*, are away from the wheel, *c*, and the turnstile is free to revolve. Upon the switch being shifted one of these bolts enters one of the holes in the wheel and the turnstile is locked. Applied to each wing of the turnstile is a spring catch which automatically engages with a keeper in the house to hold the turnstile in such a position as to insure one of the holes in the wheel remaining opposite the bolt on the slide bar.

This device, by effectually barring the egress of the switchman until he has connected the switch with the main line, prevents accidents to trains by reason of the switches on the line being improperly left open.

Further information regarding this invention may be obtained from Mr. Frederick Broughton, member of a commission for inquiring into claims arising out of the building of the Inter-colonial Railway, whose address is P. O. Box 38, Hamilton, Ontario, Canada.



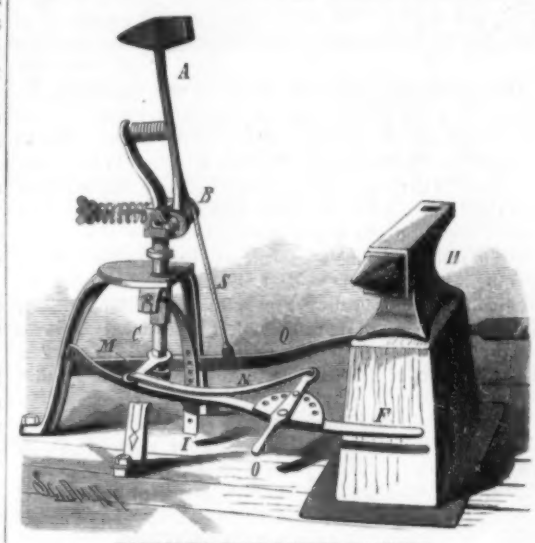
IMPROVED SAFETY SWITCH GUARD.

Five New Comets.

Dr. Gould, Director of the Observatory at Cordova, Argentine Republic, telegraphs to the Minister of Instruction at Buenos Ayres, December 15, that he observed five comets, all small ones. The Buenos Ayres *Standard* supposes that this may explain the unprecedented heat felt in the River Plate, 101° Fahr. in the shade at Buenos Ayres, where the glass rarely marks over 92° in midsummer (December–January).

IMPROVED FOOT POWER HAMMER.

The hammer handle is pivoted at B to the head of a vertical shaft, C, that is fitted in a socket in the top of the stand, so as to rise and fall, and to turn freely. The lower end of the shaft has a step in the lever, F, which is pivoted to the hind leg of the stand, and extends forward and alongside of the anvil block, where its free end is to be used by the operator for raising and lowering the hammer, as the work may demand. A bar, I, having a series of holes is attached to the stand and arranged in a slot through the lever, F, for fastening the lever at any point by a pin, in order to set the hammer at the required height. An arm, M, is attached to the lower end of the shaft, C, over the lever, and is connected



PAINTER'S FOOT POWER HAMMER.

by a rod, N, to a lever, O, pivoted to the lever, F, near the anvil block within easy reach of the operator. By moving the lever, O, which is held in any position by a pin passing through holes in a plate on the lever, F, the shaft is turned and the hammer swung along the face of the anvil.

The hammer handle is connected to a foot lever, Q, by which it is worked, by a cord, S, which passes through a slot in the handle and connects by a ring with a rod, on which a coiled spring, W, is fitted, to be contracted when the hammer is forced down, for raising the hammer again. The spring bears against the head of the shaft, C, and the rod connects with the free end of the spring by an adjusting nut, which serves to regulate the tension of the spring. The shaft, C, has a vertical, curved extension which supports a coiled buffer spring that arrests the hammer at the end of the up stroke without shock or jar. The hammer handle is adjustable forward and backward with relation to the anvil, by placing the pivot of the handle in slots; a thumb screw clamps the pivot in any desired position in the slots. This invention has been patented by Mr. John L. Painter, of Bellevue, Ohio.

Drilling and Turning Glass.

Glass may be readily drilled by using a steel drill hardened, but not drawn at all, wet with spirits of turpentine. Run the drill fast and feed light. Grind the drill with a long point and plenty of clearance, and no difficulty will be experienced. The operation will be more speedy if the turpentine be saturated with camphor gum. With a hard tool thus lubricated glass can be drilled with small holes, say up to three-sixteenths, about as rapidly as cast steel. A breast or row drill may be used, care being taken to hold the stock steady, so as not to break the drill.

To file glass, take a 12 inch mill file, single cut, and wet it with the above solution—turpentine saturated with camphor—and the work can be shaped as easily and almost as fast as if the material were brass.

To turn in a lathe, put a file in the tool stock and wet with turpentine and camphor as before. To square up glass tubes, put them on a hard wood mandrel, made by driving iron rod with centers through a block of cherry, chestnut, or soft maple, and use the flat of a single cut file in the tool post, wet as before. Run slow. Large holes may be rapidly cut by a tube-shaped steel tool cut like a file on the angular surface, or with fine teeth, after the manner of a rose bit; great care being necessary, of course, to back up the glass fairly with lead plates or otherwise, to prevent breakage from unequal pressure. This tool does not require an extremely fast motion. Lubricated as before, neat jobs of boring and fitting glass may be made by these simple means. The whole secret is in good high steel worked low, tempered high, and wet with turpentine standing on camphor.

EIGHTY-THREE per cent of the population of the United States is composed of white natives and the immigrants from Germany and Great Britain, leaving four per cent from other countries and thirteen per cent for those of African descent.

ASPECTS OF THE PLANETS FOR MARCH.

URANUS

is morning star until the 16th, when his name is registered on the roll of evening stars. He wins the place of honor for the month, on account of his opposition with the sun, the greatest event in his course. This epoch occurs on the 16th at 2 o'clock in the morning. He then comes into line with the earth and the sun, the earth being in the middle, is at his nearest approach to the earth, and, like the other planets under the same conditions, is opposite the sun, and in his most interesting aspect for observation. The five outer planets after this event are evening stars. They are all traveling from opposition to conjunction, having reached the goal in the following order: Neptune, Saturn, Jupiter, Mars, and Uranus. We shall have no more oppositions to chronicle until December, when Neptune again takes the lead.

Uranus, near opposition, is visible to the naked eye, appearing as a star of the sixth magnitude, the smallest that the eye can perceive. The position of the planet must be carefully studied before any effort is made to find him. Uranus is in the constellation Virgo, between Beta and Eta, two third-magnitude stars of the constellation. In the first part of the month, he is in a good position for observation about 9 o'clock, being then half way between the horizon and the zenith, and must be looked for southeast of the Sickle in Leo, and northwest of Spica, the leading brilliant in Virgo. He is an interesting object in a telescope, where the tiny point visible to the unaided eye is transformed into a small sphere, of a delicate greenish hue, resembling that of sea foam.

Uranus has been a known member of the system only since 1781, a little more than a century, though no one knows how many million years he has been describing his vast circuit round the sun. He was discovered by accident, Herschel, the discoverer, thinking he had picked up a comet instead of a world. Astronomers went diligently to work trying to compute the orbit of the supposed comet, but all in vain; the figures were of no avail. Finally, the theory was started that the astronomical prize picked up in the sky was another planet, revolving outside of the six planets that had been known from time immemorial. Computations now worked like a charm, and soon the new comer was mathematically imprisoned in an orbit whose deviations were to be the means of showing the presence of still another planet, traveling, as far as can be seen, on the system's remotest bounds.

There was great rejoicing in the scientific world over the advent of Uranus. Strangely enough, it was found that observers had detected his presence and marked his position on star catalogues no less than nineteen times, supposing him to be a fixed star and without a suspicion that he was a planet! Flamsteed had seen him five times, noting him on his catalogue as a star of the sixth magnitude, the first observation being in 1690, nearly a century before the discovery by Herschel. Lemonnier came nearer, for he had observed the planet twelve times, making several observations within the space of a few weeks. If he had taken the trouble to reduce and compare his observations, he might have won the prize twelve years previous to Herschel. But he had no system in his arrangements, and his papers are said to have been a very picture of chaos—an intricate observation of this very star being recorded on a paper bag that had contained perfumed hair powder!

The discovery of Uranus made Herschel famous. For six years, he looked in vain for Uranian moons. His largest telescopes, wonderful eyesight, and long practice failed to detect a single moon. Astronomy presents no more poetic picture than that of this great scholar and his sister and untiring helpmate, Miss Caroline Herschel, as through the silent hours of starlit nights they studied the mysteries of the heavens. For thousands of nights they sat side by side, watched, calculated, and recorded, the one sweeping the heavens with the telescope, the other noting the results. This they did for nearly forty years, growing old and illustrious together, forgetting to sleep, almost to eat, in their enthusiasm for their favorite science.

In 1787, Herschel's quest was rewarded. He discovered two moons, and afterward four more, as he supposed, but they proved to be myths. Mr. Lassell has since discovered two, and the Uranian planet rejoices in four satellites that travel backward or in an opposite direction from the moons of the other planets except Neptune.

Observers should try to find Uranus at opposition, for he is the most distant planet visible to the naked eye. He is a beautiful object in the telescope, and makes observers wish that he were nearer in order to be more intimately acquainted with him. It is easy to keep track of his oppositions, for they occur about four and a half days later each year. Thus the opposition this year takes place on the 16th of March, next year it will be the 21st of March, and so on.

The right ascension of Uranus on the 1st is 11 h. 49 m.; his declination is 2° 2′ north; and his diameter is 3·8″.

Uranus rises on the 1st at 7 o'clock in the evening; on the 31st, he sets at a quarter after 5 o'clock in the morning.

VENUS

is evening star, and is during the month a radiant representative of the solar fraternity. Everything favors her conditions for observation. She is moving rapidly northward, approaching the earth, approaching her eastern elongation, remaining longer every night above the horizon after the sun has set, speeding away from the great luminary along the invisible wire on which she seems to be strung like a golden bead.

On the 27th, at 9 o'clock in the evening, moving eastward, she encounters Neptune bound westward. The fairest of the stars and the most distant planet that circles around the sun have a conjunction, though not a near one, for Neptune passes 3° 34′ south. Venus seen through the telescope now presents the phase of the gibbous moon when passing from the full to the last quarter.

There are three points to be noted in regard to Venus during the month—her rapid progress northward, her progress eastward, and her long stay above the horizon after sunset. These are easily discernible to the unscientific observer, and are due to her apparent progress in her orbit, as she travels from superior conjunction to eastern elongation. We can find no new words to describe the bewitching grace of the lovely evening star, as she sits enthroned almost companionless amid the sunset glow or beams more brightly later in the evening from the darker background of the sky amid the myriad starry hosts.

The right ascension of Venus on the 1st is 1 h. 12 m.; her declination is 7° 43′ north; and her diameter is 14·6″.

Venus sets on the 1st at 9 o'clock in the evening; on the 31st, she sets about 10 o'clock.

JUPITER

is evening star. He is now nearly half way to the zenith when it is dark enough for him to become visible. As he majestically treads his starry path, he rouses feelings of admiration and awe something like those evoked by the great sun himself. To be sure, he is not a sun, but he is nearer like one than any other planet, while the stars around him are such far away suns that the feeling of relationship is entirely lost. The giant planet seems hardly to have dwindled a second since opposition, though figures say that he has diminished in diameter 2·6″, a quantity hard to estimate by unpracticed observers. The winter starlit nights are wondrously beautiful with Venus, Jupiter, Saturn, and Mars to grace the show.

The right ascension of Jupiter on the 1st is 7 h. 48 m.; his declination is 21° 44′ north; and his diameter is 41·6″.

Jupiter sets on the 1st at half past 4 o'clock in the morning; on the 31st, he sets at half past 2 o'clock.

SATURN

is evening star, ranking third in the order of brightness, being outshone by Venus and Jupiter. He holds the even tenor of his way, with seemingly small advance in his orbit, making his transit at sunset, and shining in the west on the first of the month till about midnight.

The right ascension of Saturn on the 1st is 4 h. 8 m.; his declination is 19° 17′ north; and his diameter is 17·2″.

Saturn sets on the 1st at half past 12 o'clock in the morning; on the 31st, he sets a few minutes before 11 o'clock in the evening.

MARS

is evening star. He is stationary in the middle of the month, and Jupiter presents the same aspect later in the month. Mars is still a bright object among the stars, but observers will note that his luster dims much more quickly than that of Jupiter and Saturn. Mars is of little account except for a month before and a month after opposition. As this epoch comes round but once in two years and fifty days, the favorable times for observing his ruddy face are few and far between.

The right ascension of Mars on the 1st is 8 h 25 m.; his declination is 23° 18′ north; and his diameter is 13·2″.

Mars sets on the 1st about a quarter after 5 o'clock in the morning; on the 31st, he sets about a quarter after 3 o'clock.

NEPTUNE

is evening star. He has the honor of taking part in the conjunction with Venus on the 27th, as already described.

The right ascension of Neptune on the 1st is 3 h. 36 m.; his declination is 15° 42′ north; and his diameter is 2·6″.

Neptune sets on the 1st about half past 11 o'clock in the evening; on the 31st, he sets at half past 9 o'clock.

MERCURY

is morning star after the 16th, the sole planet enjoying this distinction. He retains the honor till the 30th, becoming then evening star, so that the month ends with every one of our brother planets congregated on the eastern side of the sun! On the 30th, at 3 o'clock in the afternoon, Mercury is in superior conjunction with the sun, which means that he apparently passes from his western to his eastern side in his fleet footed course. He is of no account during the month, for he is too near the sun to be seen.

The right ascension of Mercury on the 1st is 21 h. 36 m.; his declination is 16° 10′ south; and his diameter is 5·6″.

Mercury rises on the 1st about 6 o'clock in the morning; on the 31st, he sets about half past 6 o'clock in the evening.

THE MOON.

The March moon fulls on the 11th, at 40 minutes after 2 o'clock in the evening, standard time. On the 2d, two days before her first quarter, she makes a close conjunction with Neptune, being 27′ south. On the 3d, she is near Saturn, on the 7th near Jupiter, on the 8th near Mars, on the 12th near Uranus, and on the 26th, the day before her change, near Mercury. The new moon of the 27th commences the same routine, paying her respects to Neptune on the 29th, to Venus on the 30th, and to Saturn on the 31st. She makes no close conjunction with any visible planet.

Opposition to Patent Nullification.

Perhaps the principal reason why there has not, thus far, been more general and forcible protest against the bills now before Congress nullifying our patent laws, is to be found in the fact that such proposed legislation has been frequently attempted before, and without success. Patentees and inventors should not, however, rest in any feeling of security on this account. The attack on our patent system was never before more bitter, and never apparently so well sustained, as it has been during this session of Congress. The most earnest appeals should be made, therefore, to both Senators and Representatives, though they can be supported by no stronger arguments than heretofore advanced, in order that no one of these most pernicious bills shall be allowed to slip through both houses, and become law, on any plea of inadvertence, or of failure to understand the full scope of the injury it is proposed to inflict upon the industry of the country.

Among other opponents of the proposed patent nullification by the last Congress, a committee of the Franklin Institute, Philadelphia, did good service in Washington. The bills then were of much the same character as those now urged, and of one of them the committee used the following language: "This bill legalizes theft, and is clearly unconstitutional. It is a short sighted and iniquitous piece of legislation, and should properly be entitled 'An act to discourage American invention,' since, if it become law, it would nullify the grant of all patents." The urgency for these bills was then attributed to a few grangers, whom the politicians wanted to please, and to the powerful moneyed influence of the Eastern and Western railroad associations, organized ostensibly for fostering invention, but in reality to "freeze out" all inventors who had any patents of value in the railroad business.

Mr. Reed, of Maine, a member of the present as he was also of the last House, forcibly put the objections to laws nullifying patents in the 37th Congress as follows: "The Constitution has a right motive in protecting patentees, because the public gets value received, and unless you pay inventors men will not invent. If you rob them of the proceeds of their invention after they have invented, you stop the business. And every man knows that, notwithstanding thousands of dollars are taken away from innocent men by fraudulent practices such as are complained of, there are millions of dollars conferred upon the public by this very inventive faculty. . . . What would this country be without the inventive faculty? Without the patent laws to-day it would be poor instead of rich. We owe the cheapness of everything that enters into the production of our daily bread, of everything that we wear, of everything that we use, to the inventive power. Do not strike it down; it is not wise to do so."

Apropos, however, of the foolish prejudices which sometimes influence law makers on important matters, a valued Philadelphia correspondent calls our attention to the occasion when Oliver Evans first ran a high pressure, self-propelling steam engine. It was only run from the shops in that city to the Schuylkill, but in its progress accidentally knocked down an old lamppost, whereupon a law was promptly enacted forbidding "any more such nonsense," the only law existing there to-day prohibiting self-propelling engines, although the engine thus sought to be annihilated was the precursor of the thousands of locomotives that now reach every corner of that State and of the United States.

Ruinous Legislation.

There seems to be some very strong influence at work, not only to deprive patentees and inventors of their rights, but to cripple and retard our national prosperity, which so largely depends upon new inventions and improvements. Our country would never have attained its present gigantic proportions and great prosperity had it not had the benefit derived from the great inventions of the last half century. Had the intelligence of our early statesmen been on a par with our present House of Representatives, it is more than likely that the 114 members who voted for bills 3,925 and 3,934 would now be ornamenting their own firesides, and the other 6 would have had to make their way to the capitol of the nation in a stage coach.

Even with our present laws the inventor has very little encouragement, as he proverbially lacks capital to protect his inventions, and with that little withdrawn he most assuredly is not going to work his brain for the benefit of capitalists, and like Charles Edouard Jacot, of Switzerland, referred to in the article of Feb. 2, will have to emigrate to a country where Government is wise enough to protect inventors and encourage improvements. It is to be hoped that the intelligence of our senators is of a higher order, and that they will not dishonor their record by passing bills so damaging to their constituents and the interests of their country.

W. L. B.

Poisoning by Chlorate of Potash.

At a recent meeting of the Medical Society of the State of New York, in this city, Dr. Geo. B. Fowler read a paper on Poisoning by Potassium Chlorate. He gave the history of a case in which the use of 4 to 6 drachms of the article had produced serious poisoning. Several prominent physicians also certified to the dangerous effects of the drug. Chlorate of potash is often used as a gargle for sore throat; but Dr. Sherwell, of Brooklyn, had observed that the medicine produced another form of sore throat.

Correspondence.

Where to find the Best Information on Electricity.

To the Editor of the Scientific American:

I see numerous correspondents ask what books will give them the best information on electrical science. Allow me to say that I have obtained more *practical* information out of the SCIENTIFIC AMERICAN and SUPPLEMENT than out of any set of books within my means to purchase. I have an almost unbroken file of the SCIENTIFIC AMERICAN since 1876, and such numbers of the SUPPLEMENT as contain articles of interest to me, and for the past two weeks have spent all my spare time rereading them, and was surprised at the amount of valuable information they contained.

J. S. BADGER.

Lake Geneva, Wis., Telephone Exchange, Feb. 13, 1884.

A Pocket Apparatus for Air Analysis.

Since the unwholesomeness of the air in a room or hall is nearly proportional to the percentage of carbonic acid (carbon dioxide) in the air, Dr. Wolfert, of Kaiserlautern, has devised a very simple apparatus for estimating this suspicious constituent *approximately*, to be used in school rooms, sleeping rooms, and public halls.

A small glass cylinder is filled to a certain mark with perfectly clear lime water, a very cheap article to be had at any drug store, or easily made at home. He then takes a small India rubber ball, or bulb, with a glass tube attached. On squeezing the ball until all the air is expelled it will, of course, fill itself with the air of the room. The tube is then allowed to dip into the lime water, and the air made to bubble through it by slowly, but steadily, squeezing the ball. When all the air is expelled, remove the tube from the lime water and allow the ball to fill again, taking care that no lime water is sucked into the tube or bulb. This is repeated until a precipitate of carbonate of lime is formed which obscures the numbers on the bottom of the cylinder. The number of times it must be repeated to effect this end increases with the purity of the air. Accompanying tables give the percentage corresponding thereto.

If the lime water is rendered so turbid as to be opaque by less than ten repetitions, the air is very bad, and cannot be breathed with impunity. If it requires from ten to twenty repetitions, a person may remain there for a short time. When more than twenty repetitions are necessary, the air is good enough for ordinary purposes. In sick rooms it should require at least thirty, and in contagious diseases, forty to fifty. The purer the air, of course, the longer tim the tests will take.

The apparatus is described in full in the *Centralblatt fur allgemeine Gesundheitsflege*, and is sold by Alt & Jaeger in Ilmenau at $1.25 to $4.

The Philadelphia International Electrical Exhibition of 1884.

This exhibition, to be held under the auspices of the Franklin Institute, will open September 2, and close October 11. Under a joint resolution of Congress, articles from abroad, imported solely for exhibition, may be entered free of duty. Exhibitors must pay an entrance fee of $5, and from ten to twenty cents per square foot for space. Exhibits will be classified as follows: Production of Electricity; Electric Conductors; Measurements; Applications of Electricity—1. Currents of low power—2. Currents of high power; Terrestrial Physics; Educational and Biographical. The exhibition building is the corner of Thirty-second Street and Lancaster Avenue, and will be opened for the reception of goods from August 11 to August 30.

On some Points in the Hygiene of the Ear.

Ordinarily the ear is not affected by exposure to the air. All tuberculous subjects, those of a strumous habit, and a considerable number who rank as peculiarly sensitive to atmospheric influences, are exceptions to the general rule. Damp air is much more apt to act perniciously than dry air. Sea-bathing is often injurious from the direct application of the cold water to the meatus giving rise to otitis media, or from the violent concussion of a wave upon the meatus, or the entrance of water into the Eustachian tubes. Fill the meatus with cotton and tell the patient not to inhale water or allow it to get into the mouth.

The effect of loud and discordant noises in the ear is often very pernicious. If the patient is removed from the noise before profound deafness results, he may spontaneously recover a good degree of hearing, or become wholly convalescent. Riding in railway cars with the windows open, ship-calking, and confinement in the never-ending clicking noise of the telegraph instrument may act perniciously on the ear. Musical sounds do not seem to do harm to the ears. Monotonous and discordant sounds seem alone to operate injuriously on the ears.

Cannon firing, or the discharge of firearms, or the concussion of any explosive sounds, especially when occurring unexpectedly, is likely to do great harm to the hearing. It may rupture the drum-head, or at once render the acoustic nerve unfit for functional activity. Hold the mouth open while the gun is being fired, so that the concussion may act simultaneously upon both surfaces of the drum membrane. The effect of compressed air, as experienced in the ears of divers, caisson-builders, etc., is often very pernicious. The principal mode of obviating such pernicious consequences is to cause a frequent interchange of air between the throat and the tympanum. This is accomplished by catheterization, either with the Eustachian catheter or Pomeroy's faucial catheter, or by Politzer's or Valsalva's operation. Sometimes simply swallowing, either with or without the stoppage of the nostrils, will be sufficient, in going from one compartment of a caisson to another having a different air pressure.

The ears require to be "changed," as the expression is, that is, induce an interchange of air between the throat and tympanum, so as to equalize the pressure. On the score of violence inflicted on the ear, the common practice of boxing the ears of children is liable to result in serious damage; pulling and pinching the auricles is much to be reprehended. With reference to the prevention of impaction of cerumen in the meatus, disease of the ears for the most part may be predicated when this tendency exists, and no efforts at cleanliness can prevent it. *Sunstroke* occasionally affects the hearing unfavorably—*The Medical Record.*

Obscuring Glass.

There are many ways of accomplishing this, some of the plans making the glass permanently frosted, others only temporarily so. For permanence, take a flat piece of marble, dip it into glass-cutters' sharp sand, moistened with water; rub over the glass, dipping frequently in sand and water. If the frosting is required very fine, finish off with emery and water. As a temporary frosting for windows, mix together a strong, *hot* solution of Epsom salts and a clear solution of gum arabic; apply warm. Or use a strong solution of sulphate of soda, warm; and when cool, wash with gum water. Or dab the glass with a lump of glazier's putty, carefully and uniformly, until the surface is equally covered. This is an excellent imitation of ground glass, and is not disturbed by rain or damp.

Impulses of Fools.

That by far the greater number of calamitous occurrences are attributable to impulses of fools appears from the investigations set on foot to locate the blame for the January chapter of horrors.

In nearly every instance the cry was raised, at first blush, that the owners of the vehicle of death were answerable for the mishap, and they were berated soundly for supposed criminal negligence, indifference to loss of life, or avaricious disregard of laws providing for the safety of passenger or employe. Subsequent inquiry, however, rarely failed to elicit the fact that but for the unaccountable behavior of a subordinate, against whose fatal conceits it were impossible to guard, the deplorable happening would not have come to pass.

Now and then, as in the case of the burning of a convent at Bellevjlle, Ill., the loss of life was due to a lack of precaution against manifest dangers and the absence of ordinary avenues of escape. But in most instances, as in the railroad collision at Toronto, the bursting of a boiler at Rochester, N. Y., the wrecking of the steamer City of Columbus, and the mine explosion in Colorado, besides a score of calamities less fatal (including, possibly, the Broad Ripple disaster), the blame has been fastened upon those in position to bring about disastrous results by swerving from the line of duty—by departing from a strict observance of the rules and regulations laid down for their guidance.

A conductor's rash determination to run his train upon a certain siding, regardless of orders to the contrary, resulted in the death of thirty or forty persons at Toronto. An engineer conceived the daring plan of increasing the capacity of an engine by hanging a few bricks to the safety valve, the outcome of which novel proceeding was the death of four of his fellow workmen, the maiming of a number of others, and the demolishment of his employer's mill. The City of Columbus, an iron vessel fitted out with all the means of preservation and escape in use on shipboard, was wrecked on the best known portion of the Atlantic coast, on a moonlit night, at the cost of one hundred lives, because the officer in command took it into his head to save a few shiplengths in distance by hugging the shore, in direct disobedience of the captain's parting injunction. The best ventilated mine in Colorado was converted into a death trap for half a hundred miners through the agency of one of their number, whose remains were found in the gallery he had been warned not to enter with lighted lamp. Nobody survives to throw light upon the explosion of the dynamite cartridge factory in Pennsylvania, but as that peculiar type of disaster is almost invariably attributable to the single cause of heedlessness on the part of employes, grown contemptuous from long familiarity with danger, it is conjecturable that this latest instance is not an exception to the rule.

Had the fact been established that the foregoing series of accidents might have been foreseen and avoided, the interests of property and ordinary regard for human life would demand and quickly secure the taking of measures to avert like disasters. But the unpalatable truth must be confessed that the fixing of the blame for the January mishaps leaves nothing upon which to rest the consoling thought that perhaps in the future we may be saved the depiction and contemplation of daily horrors. Against the capricious workings of the human mind inventive science buffets in vain; safety valves, air brakes, levers, rudders, danger signals, stringent regulations, the lessons of experience, the uplifted arm of the law, and even the intuitive law of self-preservation are as powerless to save as the straw in the grasp of a drowning man. Owners of vessels, railways, mines, factories, and magazines, however well equipped with safety appliances may be their ships, trains, boilers, or shafts, and however perfect their confidence in the skill and prudence of those they see fit to intrust with the management thereof, can give passenger or employe no assurance of absolute safety until man's devotion to duty gains complete ascendency over his irrational impulses—a consummation most devoutly wished for, but resignedly despaired of. There is no guarding against, no escape from the impulses of fools. —*Indianapolis Times.*

Have Inventors Any Rights?

The *Manufacturers' Gazette*, referring to recent bills passed by the House, nullifying the rights of patentees, and other hostile legislation now before both branches of the national legislature, says:

"The moment any such legislation as this takes effect, our mechanical progress will be in its decadence. Why not pass one more law, that hereafter no patents shall be allowed to anybody for any length of time, and thus stop the outlay for the Patent Office, patent lawyers, etc., and that no future litigation shall be had as to rights vested in patents? Thus cutting the whole thing down and wiping out at one fell stroke millions of dollars of property, or what has been supposed to be property, and also wiping out totally one of the strongest branches of American industry, the inventors and perfecting mechanics. We might as well do the thing right while we are about it; wipe out everything that refers to it; let them start again, but make the thing sure that no man has rights that another one is bound to respect.

The *St. Louis Miller*, speaking of the bill of Mr. Ray, (H. R 1081) of New York, before the House, says:

"There is a vast deal of twaddle in many of the arguments of those who try to break down Government grants of rights and franchises on the ground that monopoly should be discouraged. The people at large are quite indifferent as to the cost of a public benefit, until after it is secured. Then they too often seek to prevent the originators of the benefits from reaping any permanent or extended profits therefrom. The public is totally conscienceless on this point, and is ready to evade the terms of a distinct contract whenever it can be done in a slightly roundabout way. The repeated and continuous attacks upon the effectiveness of our patent law which has been made in Congress after Congress are abundantly illustrative of the spirit to which we allude. . . . Under this proposed law some piratical adventurers with a little money could readily inform themselves regarding a few meritorious articles just patented by poor and obscure inventors, could quickly manufacture immense stocks of the goods, and could then throw them on the market so suddenly and extensively that stopping the traffic by the service of notice would be simply impossible. Moreover, honorable manufacturers who might be willing to allow inventors a reasonable royalty would be afraid to make a bargain for the legitimate production of the patented novelties. They would fear to do so lest others less honorable might be even then secretly making the same goods and might soon flood the country with them. The New Yorker's bill is an unjust one, and should be forever tabled."

An Electrical Lounge.

In a furniture establishment in this city a ladies' boudoir is fitted up on the ground floor for the convenience of customers. It is carpeted, and furnished with a handsome plush lounge, chairs, tables, etc. A friend is invited to lie down upon the lounge for a moment, and, in the act of getting up, requested to touch a certain twilled binding cord containing gilt tinsel, which emits quite a sharp electric spark, much to the surprise of the victim. The spark is just as strong upon a damp, foggy day as when the weather is clear and dry. The proprietors have named the piece of furniture "an electrical lounge." How the electricity was produced was a mystery. An easy explanation was found. On investigation, the room proved to be located directly over a hot air engine, employed to work the elevator. Two belts from the engine were located over the same, and ran with great speed in opposite directions; sparks of electricity were frequently seen to be given off from the belts.

As the room overhead was kept perfectly dry from the heat of the engine, and the belts were not far from the floor, it is supposed the belts acted like a frictional electric machine, electrified the floor above, some of the electricity passing to the carpet and lounge, charging the same like a Leyden jar, and delivering a spark when touched.

Working and Thinking.

It is a no less fatal error to despise labor, when regulated by intellect, than to value it for its own sake. We are always in these days trying to separate the two; we want one man to be always thinking and another to be always working, and we call one a gentleman and the other an operative; whereas the workman ought often to be thinking and the thinker often to be working, and both should be gentlemen in the best sense. As it is, we make both ungentle, the one envying, the other despising his brother, and the mass of society is made up of morbid thinkers and miserable workers. Now, it is only by labor that thought can be made healthy, and only by thought that labor can be made happy; and the professions should be liberal, and there should be less pride felt in peculiarity of employment and more in excellence of achievement.—*Ruskin.*

Emulsions of Petroleum and their Value as Insecticides.

BY C. V. RILEY, OF WASHINGTON, D. C.

The value of petroleum for the destruction of insects has long been recognized, and I have for years been endeavoring to solve the question of its safe and ready use for this purpose without injury to plants. This paper contains the results of extended experiments carried on under my direction by several of my assistants, and particularly by Prof. W. S. Barnard, Mr. Joseph Voyle, of Gainesville, Fla., Mr. Clifford Richardson, assistant chemist of the Department of Agriculture, and Mr. H. G. Hubbard, who has for over a year been devoting his time to practical tests in orange groves at Crescent City, Fla.

Passing over the ordinary methods of oil emulsions by phosphates, lactophosphates, and hypophosphites of lime, and various mucilaginous substances, experience shows that, for the ordinary practical purposes of the farmer and fruit grower, soap and milk are among the most available substances for the production of petroleum emulsions.

Ordinary bar soap scraped and rubbed into paste at the rate of twenty parts soap, ten parts water, thirty parts kerosene, and one part of fir balsam will make, when diluted with water, an emulsion stable enough for practical purposes, as the slight cream which in time rises to the surface, or the flakiness that often follows, is easily dissipated by a little shaking. Soap emulsions are, however, less satisfactory and efficient than those made with milk. Emulsions with milk may be made of varying strength; but one of the most satisfactory proportions is two parts of refined kerosene to one part of sour milk. This must be thoroughly churned (not merely shaken) until a butter is formed, which is thoroughly stable and will keep indefinitely in closed vessels, and may be diluted *ad libitum* with water when needed for use. The time required to bring the butter varies with the temperature, and both soap and milk emulsions are facilitated by heating the ingredients. Ordinary condensed milk may also be used by thoroughly stirring and beating it in an equal or varying quantity of kerosene.

The diluted emulsion, when prepared for use, should be finely sprayed upon the insects to be killed, its strength varying for different insects or plants, and its effect is enhanced when brought forcibly in contact with the insects.

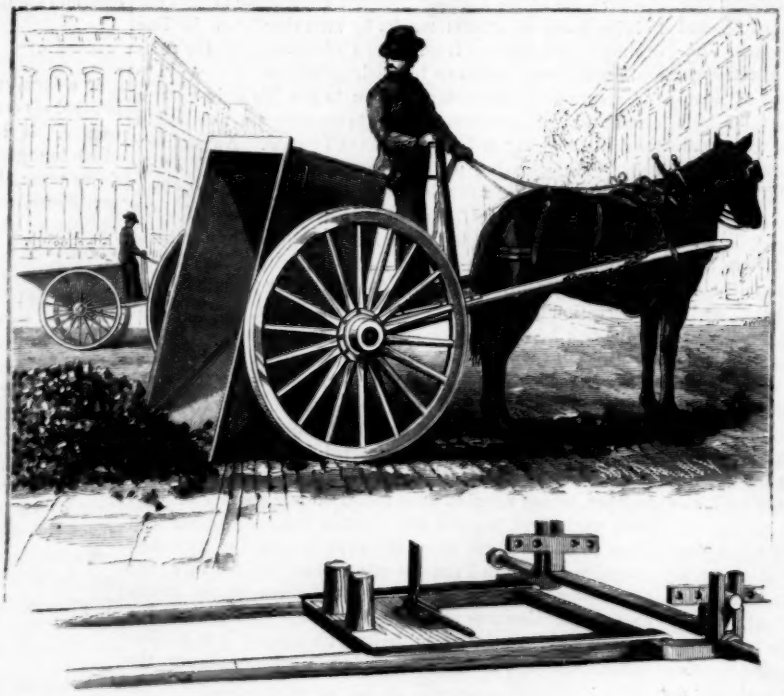
Of mucilaginous substances, that obtained from the root of *Zamia integrifolia* (a plant quite common in parts of Florida, and from the stems of which the Florida arrowroot is obtained) has proved useful as an emulsifier.

These petroleum emulsions have been used with success by Dr. J. C. Neal, of Archer, Fla., against the cotton worm, without injury to the plant; but their chief value depends on their efficacy against the different scale insects which affect citrus plants. Experience so far shows that such plants do not suffer from its judicious use, but that it must be applied with much more care to most deciduous fruit trees in order not to injure them.

IMPROVED RAPID DUMPING CART.

The dumping cart herewith illustrated is very simple in construction and at the same time durable and comparatively cheap. There is no tailboard to remove in order to dump, or replace after dumping; hence, time and labor are saved. The axle is made of one piece of iron or steel, with cranked parts that extend forward at right angles to the journals a suitable distance to give space in which the body may have room to swing when it dumps. The body is hung upon trunnions or pivots fitted in guide grooves rising vertically from the axle just back of the journals, and so adjusted that the bottom of the body will be at such distance below the trunnions that it will swing back easily to the upright position after being dumped. Springs may also be attached to the axle to relieve the force of the dump and to assist in recovering the body to its proper position. The construction of the axle is clearly shown in the lower engraving.

The shafts are attached to the axle, and are connected together by a cross bar in front of the axle. On the cross bar is secured a socket plate which carries a fastening latch engaging with a hasp which is rigidly attached to the front end of the body, so that when the latch is raised at its outer end it will swing clear of the point of the hasp and release the body for dumping; when the body falls back it will be fastened automatically. The latch lever is arranged along the connecting bar at the front of the body, so that the driver may raise it with the toe of his boot, while standing on the shafts or sitting on the edge of the box, without letting go of the reins.



HILL'S RAPID DUMPING CART.

This invention has been patented by Mr. Thomas Hill, whose address is Nos. 48 and 50 Railroad Avenue, Jersey City, N. J.

WE learn from a foreign contemporary, what we have never heard of at home, that "in dull seasons in America it is not an unusual thing for several manufacturers to combine, charter a steamer, and take a cargo of their goods to some of the South American and other ports, and realize very often at whatever price the goods will fetch."

THE PONS-BROOK COMET.*

On the 17th of December, at 6 h. 3 m., Marseilles mean time, I made an observation of the comet of 1812, by means of a telescope of 156 mm. aperture, provided with an eye piece that magnified 85 times. The sky was not very clear, and the observation was interrupted several times by the thick vapors by which the comet was obscured.

The comet was easily visible by the naked eye, and appeared more brilliant than the stellar mass of Hercules,

THE PONS-BROOKS COMET AS OBSERVED AT MARSEILLES.

which it resembled; only there was seen shining at times through its nebulosity a vague spark, that indicated that it possessed a tail. Seen in the telescope, the comet exhibited a nucleus, a coma, and a tail. The nucleus had the brilliancy of a star of the sixth magnitude, although its diffuse contours rendered it quite difficult to make an exact comparison with the stars. It possessed a very appreciable diameter, and was not circular, but slightly elongated in a direction nearly perpendicular to the axis of the tail.

The coma, which was very brilliant, had a diameter of about 10′, but it faded out so gradually in the heavens that it was impossible to recognize its exact limits. At first sight it resembled a globular nebula strongly condensed around a central nucleus, but, regarded attentively, it appeared as if it were double and formed of two semicircular parts that were turned toward the sun, and that were prolonged behind to form the tail. The interior portion, which was much more brilliant than the exterior, surrounded the nucleus, which latter was not, however, in the center of its curve, but was nearer to it on the side toward the sun. In extending back, this internal coma formed of itself nearly the entire tail. The external coma, which was much less luminous, was much longer, too, and it likewise was prolonged behind to form the tail; but it became invisible at a short distance, thus giving the tail a pyramidal aspect.

The tail, although it was not very brilliant, was distinguishable at first sight, and terminated in a point at a distance of 25′ from the nucleus. Like those of the coma, its edges dissolved away gradually in the sky and were lost to sight. The tail had a northwest direction—one that pointed away from the sun.

The accompanying figure is a reproduction of the drawing that I made during this observation, and represents the comet as it then appeared.—*La Nature.*

* By E. L. Trouvelot.

Politeness by Telephone.

A Mexican correspondent says: "There is a considerable variety of tongues among the messages going over the telephone wires in Mexico; many persons who cannot speak each other's language wishing frequently to be put in communication, so the offices usually have an attendant interpreter. The peremptory American method of making telephone calls—'Hello!' 'Hello?' 'Give me 1,299!' etc.—would never do in the polished Castilian tongue. Courtesy of intercourse must be preserved even between invisible communicants, and the unseeming vexatiousness and petulance which the telephone seems to provoke in Saxon moods is never allowed to obtain utterance here. The regular response from the central office to a telephone call is 'Mande usted!' which is equivalent to 'At your command!' Then preliminaries are gone through something as follows: 'Good morning, senorita; how do you do?' 'Very well, I thank you; what service may I render you?' 'Will you kindly do me the favor of enabling me to speak with Don So-and-so, No. 777?' 'With much pleasure!' etc., etc., and when the connection is made, the usual polite introductories are gone through before proceeding to the business in hand."

Growing Basket Willow.

There are many little by-productions, or what are generally so considered in relation to larger interests, that often bring to those engaged therein very substantial proceeds. A correspondent of the *Prairie Farmer* classes the growing of basket willow as at present furnishing an example of this kind. The prices have been such as to afford good profit, and the cultivation is very simple.

The cuttings, about 9 inches long, are stuck down in the soft earth in a slanting position, leaving about 2 inches above ground. There is no danger of their failing to grow. After this, the cultivation is no more than for corn. They will grow on any land. They are grown on land so wet that it could not be plowed or cultivated, but dry ground is better. At present there is not enough grown in this country for consumption, and $500,000 worth is imported each year. Peeled willow is now about $100 per ton.

Why does Flour Spoil?

Balland discusses the changes of flour in a paper contributed to *Comptes Rendus*. He says that grain contains a germ which seems to be situated near the germ. This ferment is insoluble, and has the properties of an organized ferment. It is able to endure a temperature of 212° Fahr. when dry, but is destroyed by boiling water. Both warmth and moisture are absolutely essential to its development and growth; a damp heat of 77° Fahr. is the most favorable. It acts upon the gluten liquefying.

In a properly constructed mill the greater portion of the ferment remains in the bran, and the better the flour is bolted the less of the ferment it will contain. If the mill grinds too hard or runs too fast more of it passes into the flour, hence the changes noticed in what is called flour that has heated.

The acid noticed in old flour is not the cause of the gluten decreasing, but the result of it.

Investigations upon gluten have not yet cleared up its mysteries. It seems to contain variable quantities of water, and there are certain substances, like common salt, which prevent its balling together; while others, like dilute acetic acid, directly favor it.

The gluten in flour heated to steam heat retains its properties. The action of this ferment is retarded, but not prevented, by lack of water; as soon as water and heat are applied, it recovers its original properties.

The following conditions must be observed in making flour to have it keep well: It must be sound flour from hard, dry grain, which must be well bulled in properly constructed mills and thoroughly bolted. It must be kept in a place that is completely protected from heat and moisture. The French war department use air tight metallic boxes for keeping flour in fortresses. Only flour from dry grain and the first grinding is used.

While engaged in this investigation the author has satisfied himself that the French military use the finest flour, to which, however, is added 12 to 18 per cent from the second grinding, which corresponds to the legal requirements. This latter is a source of change, and yet we cannot entirely avoid making use of the second milling, for it is in the second grinding that the very nutritious portion of the grain is separated from the bran. But we can provide against this change by storing the two different qualities *separately*, instead of mixing them. The fine flour alone keeps well, and the other, which does not keep so well, is always used fresh, and the two mixed when used.—*Chem. Zeitung.*

Calling a Dog by Telephone.

It is said a gentleman who possesses a remarkably intelligent dog recently lost the animal in the city streets. Jack was happily found by a friend of his owner, who recognized him immediately, and at once called up his friend by telephone. "Have you lost your dog?" "Yes; have you seen him?" was the reply. "Suppose you call him through the telephone." The dog was lifted up and the earpiece placed at his ear. "Jack! Jack!" called the master. Jack instantly recognized the voice and began to yelp. He licked the telephone fondly, seeming to think his master was inside the machine.

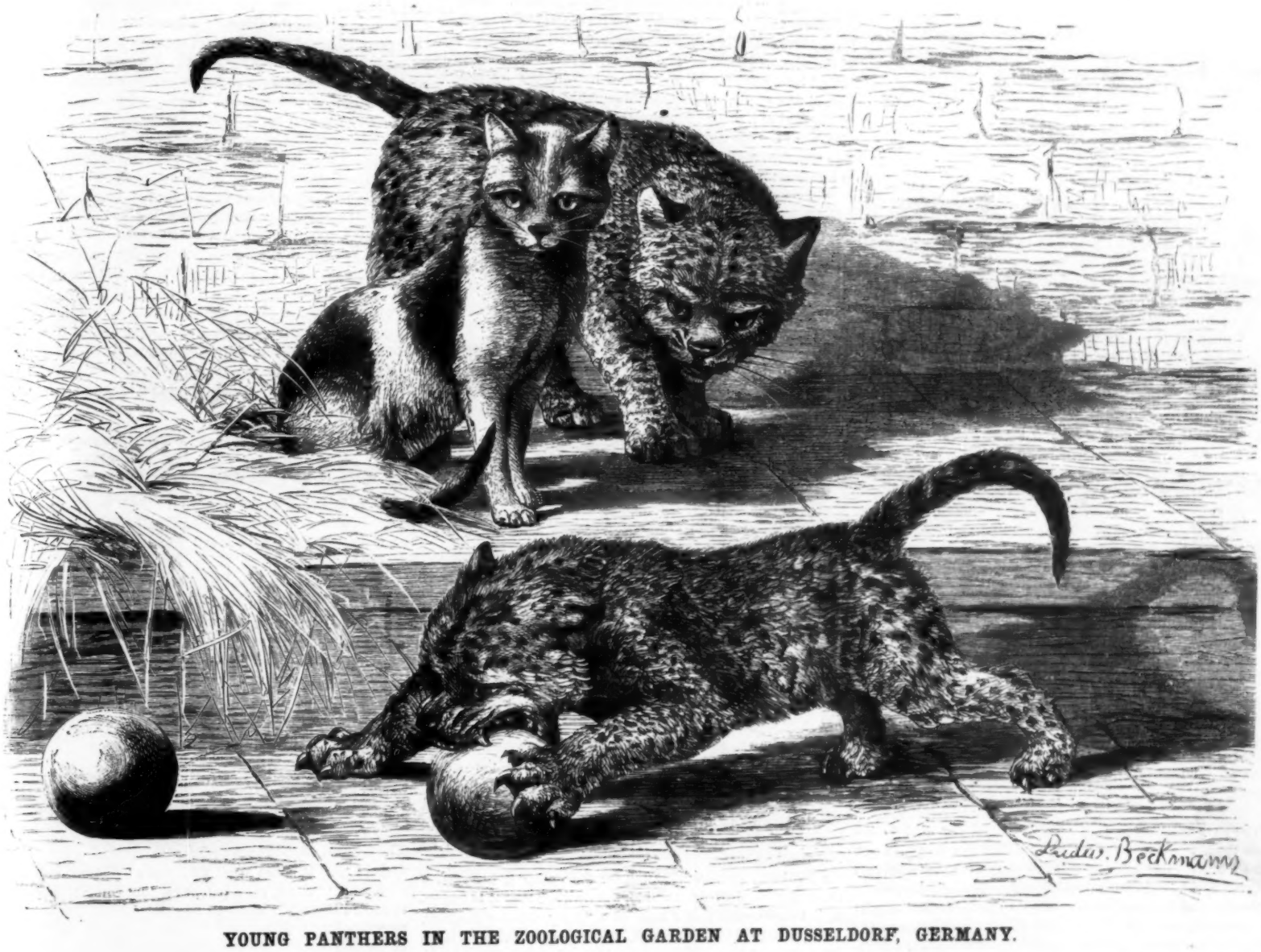
YOUNG PANTHERS IN THE ZOOLOGICAL GARDEN AT DUSSELDORF, GERMANY.

Last year two panthers were born at the zoological garden at Dusseldorf, but the mother, a yellow panther, devoured both cubs, which resembled the father, a black panther.

A short time ago two cubs were born of the same parent animals. They were born blind; one opened its eyes after four days, the other after eight days. In the beginning they were of a dark, blackish gray color, but this color gradually changed to light gray and a yellowish tint.

Immediately after birth the cubs were taken from their mother and given to two sucking cats, who nursed their adopted children with the greatest tenderness and care. The cubs grew wonderfully, and soon surpassed their foster mothers in size and strength; but notwithstanding that they were cared for in the best manner, they soon began to show signs of sickness, and died of softening of the bones, a malady common to young animals of prey.

The annexed, from a drawing by L. Beckmann, is taken from the *Illustrirte Zeitung*.



YOUNG PANTHERS IN THE ZOOLOGICAL GARDEN AT DUSSELDORF, GERMANY.

Animated Frozen Fish.

The *American Angler* vouches for the following fish story: A fish dealer in Salineville, Ohio, received a box of frozen fish from Cleveland, during one of the recent blizzards. They were so hard and brittle that they had to be handled with great care to keep them from breaking to pieces. He sold one to an old lady who took it home and put it in a bucket of cold water to thaw out gradually. During the night she heard something splashing around in the kitchen. Supposing it was the cat trying to get the fish, she jumped out of bed, seized the broom, and rushed to the scene. She found the fish flopping in the pan. As near as could be learned this fish had lain out in the cold two nights before being packed, and had been out of the water for more than two weeks.

Tumbler Pigeons.

The tumbling of the pigeon is a habit which, if seen in a wild bird, would certainly have been called instinctive; more especially if, as has been asserted, it aids these birds in escaping from hawks. There must have been some physical cause which induced the first tumbler to spend its activity in a manner unlike that of any other bird in the world. The behavior of the ground tumbler or Lotan, of India, renders it highly probable that in this sub-breed the tumbling is due to some affection of the brain, which has been transmitted from before the year 1600 to the present day. It is only necessary gently to shake these birds, or, in the case of the Kalmi Lotan, to touch them on the neck with a wand, in order to make them begin rolling over backward on the ground. This they continue to do with extraordinary rapidity until they are utterly exhausted, or even, as some say, until they die, unless they are taken up, held in the hands, and soothed; and then they recover. It is well known that certain lesions of the brain, or internal parasites, cause animals to turn incessantly round and round, either to the right or left, sometimes accompanied by a backward movement; and Mr. W. J. Moore (*Indian Medical Gazette*, Jan. and Feb., 1873) gives an account of the somewhat analogous result which followed from pricking the brain of a pigeon with a needle. Birds thus treated roll over backward in convulsions, in exactly the same manner as do the ground tumblers; and the same effect is produced by giving them hydrocyanic acid with strychnine. One pigeon which had its brain thus pricked recovered perfectly, but continued ever afterward to perform somersaults like a tumbler, though not belonging to any tumbling breed.

The movement appears to be of the nature of a recurrent spasm or convulsion, which throws the bird backward, as in tetanus; it then recovers its balance, and is again thrown backward. Whether this tendency originated from some accidental injury, or, as seems more probable, from some morbid affection of the brain, cannot be told; but at the present time the affection can hardly be called morbid in the case of common tumblers, as these birds are perfectly healthy and seem to enjoy performing their feats, or as an old writer expresses it, "showing like footballs in the air." The habit apparently can be controlled to a certain extent by the will. But what more particularly concerns us is that it is strictly inherited. Young birds in an aviary which have never seen a pigeon tumble take to it when first let free. The habit also varies much in degree in different individuals and in different sub-breeds; and it can be greatly augmented by continued selection, as seen in the house tumblers, which can hardly rise more than a foot or two above the ground without going head over heels in the air.—*Charles Darwin.*

Some Recent Scientific Discoveries.

Mr. Hughes' researches, which tend to show that a magnet is made up of a great number of atomic magnets or molecules, is, perhaps, the most interesting of the many papers on electric science which have been published in the course of the last twelve months. Several new comets have been detected, and, as one of the conclusions derived from the recent transit of Venus, it is announced that the sun's distance from the earth is ninety-two million seven hundred thousand miles.

Dr. Hughes has succeeded in photographing the sun's corona by producing an artificial eclipse, and, among other applications of photography, a compass has been devised by which a ship's course can be unerringly chronicled by aid of the sun, thus no longer rendering captains and courts of law dependent on the veracity of steersmen or the entries in logbooks.

Professor Langley has shown that the normal color of light is not white, but bluish, and in chemistry, which, like physics, has for the most part been "practical" in its labors, a new species of explosive—one of the dynamite family—known as "panclastite," ought to be credited, or discredited, to M. Turpin.

In biological science, though the amount of work done has been considerable, there is less of popular interest to note. The curious fresh water jelly fish, which appeared so mysteriously in the Victoria tank in the Royal Botanic Gardens, in Regent's Park, has again shown itself; and as indicating that the botanist has not yet quite exhausted the globe, the island of Socotra, in the Red Sea, has yielded to one visitor no fewer than thirty-seven new species of plants. But, perhaps, the most important discovery in biology which 1883 has to boast of is that which tends to prove that the protoplasm in cells passes through their walls, uniting them with other cells, contrary to the view formerly held. Should this statement be generally confirmed, it will rank among the greatest of the year's achievements.—*London Standard.*

Cause of the Red Twilight.

The conclusion reached by Joseph Wharton, of Philadelphia, from experiments made with dust found in the snowfall of January 20, last, that the brilliant twilights of the past winter were caused by volcanic particles in the air, finds corroboration in the experience of the ship Ridgway, which arrived at this port last week. Mr. Wharton has secured from the ship specimens of pumice which covered the sea on that portion of her voyage when about 500 miles from the island of Krakatoa, the scene of the Javan volcanic convulsion. He finds this pumice to be substantially identical in its composition and structural arrangement with the strange dust he found in the snow.

Chemical Analysis in Manufactures.

The successful pursuit of any business depends mainly on the intelligence of the men engaged in it. It is not enough in these times for a man to have qualified himself by a general commercial education as ordinarily understood. He must have had some knowledge of science, and have been trained to see the necessity of relating his plans and methods of working to principles of technology. No manufacturing business can be thought of without also thinking of the services of the physicist and chemist.

The baker who makes our bread needs to know the percentage strength of his yeast as a ferment, or of the baking powder he uses to raise the bread. If he use baking powder, he may depend on working experience to aid him in maintaining the quality of his work. Such experience unassisted by frequent tests is a very fallacious guide. There are in the market several very good powders, but each one has a varying constitution, sometimes giving more, sometimes less, than the standard results. If fifty cents per pound be regarded as a good value for serviceable powder of 125 cubic inches of gas per ounce of powder, then it follows that rival powders yielding but 100 or 75 cubic inches are not worth more than half the money. Exact analysis in this case can alone determine values.

The sugar refiner is dependent on the chemist for the successful conduct of his business. He must know in buying a cargo of raw sugar about how much sugar, in terms of the polarimeter, he will get from a ton of raw material. The beet root sugar manufacturer needs still more than the worker in sugar cane to know the percentage sugar value of his beets, and not merely so, but to know the quantity of impurities—such as potash and soda salts—which retard crystallization in the pans.

The cotton manufacturer and the cloth weavers need to be informed of the quality of their bleaching materials. How much of chlorine gas can be evoked from a sample of bleaching powder. The value of the article depends on the amount of chlorine gas that can be turned out of it. The dyer also needs analytical processes to aid him in his selection of dyeing materials; differences in the percentage strength of any one of his ingredients would spoil the work he undertakes. The harmony of color, the beautiful shading of his work, depend entirely on his obedience to principles of chemistry. The manufacturer of chemicals tests every description of materials he manipulates. The iron and copper pyrites, which yield him sulphur for his sulphuric acid, are bought at per cent of sulphur they yield. The common salt used to make the hydrochloric acid must pass through the same ordeal before it can take its place in the list of manufactured goods.

The manufacturer of fertilizers must be most scrupulously careful in his examination of raw materials. His phosphate must yield tribasic-phosphoric acid; his sulphuric acid must be fully up to the strength called for by the terms of his contract, and the sulphate of ammonia which he buys from the gas house must be pure. The blood he obtains from the slaughter houses must give him the 13 or 15 per cent of ammonia which the article ordinarily contains. Any variation in the strength of dried blood will lessen or increase its value to the amount of $2.50 to $3.00 per cent according to the market values.

The value of lime to the builder for the manufacture of mortar depends on the percentage of real lime, or oxide of calcium, it contains. The quantity of this determines the amount of water it will take up and the efficiency of the set mortar when it is converted into calcium carbonate in the walls of a building. Fresh or caustic lime makes good mortar, but partially slaked lime is unfit for use as a cement.

The gas engineers depend on the analysis of coal to inform them what quantity of illuminating gas they can get from a given cargo of coal, and the percentage of residuals —as coke, tar, and ammoniacal liquor—they will furnish.

Smelters of iron and copper ores rely on chemical analysis for economical working, and in many businesses the purity of the metals determines their fitness for their respective functions in the arts. Pure metals are an absolute necessity to the electrician in construction of machines for telephonic, telegraphic, and lighting purposes.

The handmaidenly help of chemistry has frequently decided the question of profit or loss for many a manufacturer. The more efficient this great science can be made in its operations the more prosperous will the manufacturing interests of the country become. The more we can learn to appreciate this force the easier will be our work, and the burdens we carry will lighten.—*The Canadian Manufacturer.*

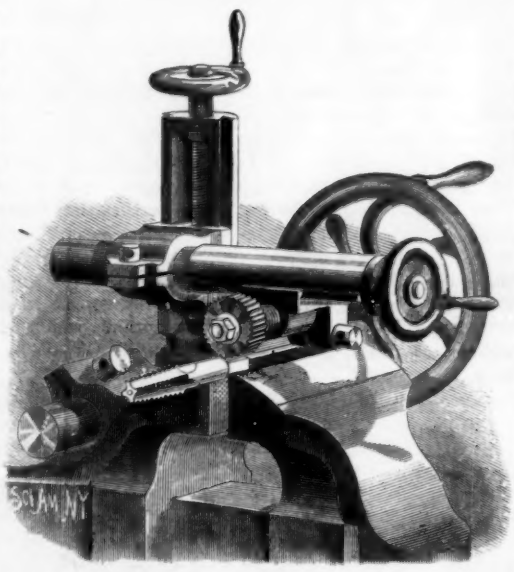
A Station Indicator for Cars.

An automatic station indicator, invented by Mr. H. E. Bissell, of Hartford, Conn., is now being tried on the elevated railroads in New York. One of these indicators is in operation on the cars in use on the branch road running to the 34th Street ferry, and has so far worked very well. At either end of the car, just above the door, is a neat box on which is painted the words, "Next Station." Below this appears the name of the station at which the next stop is to be made by the train. For example, take a train on the Third Avenue line: A passenger entering the up-train at 9th Street will see at each end of the car "Next Station—9th St." But as soon as the train left that station he would hear a bell ring at either end of the car and would see the annunciator change to read, "Next Station—14th St." The same changes would be made at 18th, 23d, and 28th, and so on up. At 34th Street station the annunciator would read: "Change cars for 34th Street ferry," and at 42d Street, "Change cars for Grand Central Depot." All these changes are made automatically and at the same time in every car on the train. The machinery is very simple, and the ringing of the bells and changing of the indicator are accomplished by the moving of a small lever in the locomotive cab, which is connected with the air brake valves. The connections between the cars and the locomotive are simple rubber tubes similar to air brake hose, but smaller in size.

A NEW ATTACHMENT FOR VISES.

The machinist, model maker, or amateur who is not so fortunate as to possess a milling machine is often obliged to spend hours with the file, etc., over a job which can be easily, quickly, and accurately done with a rotary cutter. Milling cutters are sometimes used on an arbor running in a lathe, but from the lack of means of adjustment their use in this way is quite limited.

This attachment will not only reduce very much the labor performed at the vise bench, but will save its cost in a short time in files. A file once dulled is useless, but the milling cutter can be sharpened again and again. The reproduction of a number of small articles of the same form is easily accomplished by the use of suitably shaped cutters. This attachment can be bolted to any vise by the aid of clamps, or it may be carried in a special place cast for it on the rear jaw of the vise, as shown in the engraving. It can be readily turned back out of the way when not in use by simply loosening a screw, and without detaching it from the vise. In the case of a piece of work too large to be held in the vise, the machine can be clamped directly to the work itself. The standard and arms are of round section, and can be fixed in position to operate at any angle and on any piece of work



SCHERMERHORN'S ATTACHMENT FOR VISES.

that may be held in the vise. It is adjusted vertically by a screw as shown, and is fed back and forth over the work while the cutter is revolved by the hand at the wheel shown on the right.

Horizontal adjustment is accomplished by a threaded sleeve working in a split bearing which can be clamped to hold the cutter in any position without interfering with its free revolution.

By substituting a drill chuck for the cutter it becomes a most efficient drilling machine, doing work that it is impossible to accomplish in a lathe or ordinary drilling machine. For cutting off bars, rods, etc., the milling wheel is replaced by a circular saw. This invention has been patented by E. E. Schermerhorn, of 125 West 53d Street, New York.

Fire-Proof Theaters.

In two recently constructed theaters abroad—one at Edinburgh and the other in London—special effort has been made to render them practically fire-proof. With this view, one of the most important provisions is that of building the proscenium wall, separating the stage from the auditorium, from the basement to the roof, and providing its large opening with an iron curtain. In the case of the new Prince's Theater, London, this fire-proof curtain weighs 7½ tons, is 30 feet 6 inches wide by 28 feet 6 inches high, and is constructed of two screens of wrought iron plate ⅛ inch thick, forming a double division, with an air space of 6 inches between.

This curtain is raised by means of a hydraulic ram, for which only 84 gallons of water is required, furnished by the city mains. It may be raised or lowered in 40 seconds, by simply touching a lever in the prompter's box. The only two other openings in the proscenium wall at this theater having iron doors, a fire on the stage might thus be readily separated completely from the audience portion of the house.

Messrs. Clark, Bunnett & Co., of London, and of No. 162 West Twenty-seventh Street, New York, constructed and put up the fire-proof curtains in both the above theaters.

Death of Professor Guyot.

Arnold Henry Guyot, Ph.D., LL.D., Professor of Geology and Physical Geography at Princeton for nearly thirty years, died there on February 8, in his 77th year. He was of Swiss birth, and an intimate friend of Prof. Agassiz, with whom and Forbes and Desor he made a specialty of the study of glaciers. He had been Professor of History and Physical Geography in the Neuchatel Academy from 1839 to 1848, coming to America in the latter year, where he delivered occasional lectures at Cambridge on the relation between physical geography and history, that attracted wide attention. He also lectured in the Massachusetts normal schools, and was employed by the Smithsonian Institution to organize a system of meteorological observation. At Princeton, where he was for so many years, he was regarded by the other professors as remarkable, not only for his wisdom and scientific attainments, but also for his great gentleness and humility. He was the founder of the Museum there, which is regarded as one of the best of the kind in this country; and many of the specimens were collected and arranged by his own hands.

Professor Guyot prepared a series of primary, intermediate, and physical geographies between 1866 and 1873, which had an extensive use in the public schools of the country. At the Vienna International Exhibition, in 1872, he received a medal for his geographical works. Before the Evangelical Alliance in New York, in 1873, he read a paper on "Cosmogony and the Bible." Almost his latest work was the preparation of a biographical memoir of Professor Louis Agassiz, for publication by the National Academy of Sciences, of which he was an eminent member. Half of this was read in October, 1877, at the semi-annual meeting of the Academy in New York. He co-operated with President Barnard, of Columbia, in editing Johnson's "Cyclopedia." The last work of this voluminous writer, "Creation," showing the harmony of Mosaic cosmogony with the facts of science, is now in the hands of a publisher. He had been hourly expecting the arrival of the first copies, and a message came a short time after his death, stating that the delay was occasioned by the fact that he had been addressed at Princeton, N. Y., instead of Princeton, N. J.

This work had engaged the Professor's attention during the past fifteen years, and he had fondly looked forward to its completion as being the crowning work of his life. It seems a pity that he should thus have been deprived of what would have afforded him the highest pleasure he would have asked in his closing hours.

Value of Small Things.

Some years ago a firm in England patented a candle. Now, a candle seems to be a pretty small thing to patent, but it made a fortune for its owners, and when one reflects on the large number of candles annually consumed they will better realize that a very small royalty on every pound of them will aggregate a large revenue. Similar instances might be given from cases at home, where inventors have originated some simple article in daily use, patented it, and then have received large rewards. "Despise not the day of small things," says the proverb, and we may say in addition, deride no idea as useless that intends to advance the arts and sciences in ever so small a degree, merely because it seems simple.

A very great misconception prevails in the minds of many persons in respect to patents. They are regarded as stepping stones to fame! This is usually a delusion. An invention is first and principally an investment—just as an artist's picture. The glory and renown attaching to either picture or invention is the after part—the dessert to the solid feast of dollars and cents. The natural result of the mistake alluded to is to lead persons to underrate the value of their ideas. It is not at all uncommon to hear individuals exclaim: "What, get a patent on that thing!" in alluding to some little affair that can be carried in the pocket. That very despised "little thing" is just as likely to be the means of putting dollars into the pocket of its patentee as the little candle patent was the foundation of one of the largest candle manufactories in England.

How long would it take to fill the Sahara?

In view of the recent project to fill up the Desert of Sahara by connecting it with the Mediterranean Sea, a correspondent, E. L. B., writes to us inclosing a few figures, the results of some calculations.

According to the latter it would require 4,000 years for the waters from the Mediterranean to fill the valley of the Jordan, which is 1,000 feet below the former, the water to flow through a passage 100 ft. wide by 25 ft. deep with a velocity of 4 miles an hour. With a channel 100 times this capacity it is possible, he says, to limit the period of filling to 40 years. At the same rate it would take 40,000 years to fill up the Caspian Sea to the sea level, and thousands of years to fill up the Sahara.

To Cure Bacon without Smoking.

Curing bacon by hanging it up, after proper salting, in a tobacco barn, is recommended by a Kentucky correspondent as making a sweet and perfect cure, with no necessity for smoking, and leaving no taste of tobacco in the meat. It is probable that the aroma given off by the tobacco has a mild antiseptic effect, such as that which belongs to creosote, carbolic acid, and other substances which occur in wood smoke.

A New Potato.

At a recent meeting of the Linnæan Society, at London, a paper was read by Mr. J. G. Baker, on the species of *Solanum* which bear the tuberous roots called potatoes. Out of the 700 species of *Solanum* known to botanists, there are only about six which produce tubers, and only one of these, the common potato, *Solanum tuberosum*, has as yet been cultivated. Mr. Baker said that the native home of the potato is those parts of Chili where the air is exceedingly dry, and that it grows at a considerable altitude. There is, however, another species, which grows in the moister portions of the same country, where the climate is even damper than in Great Britain, and this species would, therefore, be far more suitable for cultivation. As long ago as 1826 some specimens of this potato were sent to England, and were cultivated by Mr. J. Sabine ("Hort. Trans.," v., p. 256, etc.), but were supposed to be identical with the common potato, and did not attract any further attention. When growing in the wild state the roots are small and of a bitterish taste, some with red and others with yellowish skins. Under cultivation, however, the plants were found to grow most luxuriantly, sending out stems in all directions, so that two plants yielded in one year over 600 tubers, and the principal stems were more than 7 feet long, while the tubers showed a remarkable increase in size and had lost entirely their bitter flavor. The ordinary potato is grown as if its sole object in life were to produce tubers, and, moreover, it is grown under artificial conditions of climate and soil. Under these circumstances, the plant naturally loses its vitality, as indicated by the fact that after a time it ceases to produce flower and seed, and it then readily becomes a prey to the potato disease. The same rule applies to other plants, where one function is stimulated at the expense of another. The best method therefore of preventing the potato disease is to grow that potato which is most suitable to the climate, and to restore the vitality as soon as the plants cease to flower and fruit by cutting off the stems which produce tubers and saving only the roots, which obtain nourishment for the plant. Another species, *Solanum Commersoni*, a native of the eastern portion of South America, being found at Montevideo, Buenos Ayres, etc., is now being cultivated experimentally in France, and is likewise suitable for damp soil. A third species, *S. Jamesii*, is being experimented with in the United States, but of these the *S. Maglia* seems the most likely to promise good results.

The Western Floods Unavoidable.

A Kentucky civil engineer writes to suggest that we open the columns of the SCIENTIFIC AMERICAN to a discussion of the best engineering methods for the prevention of the disastrous overflows in the Ohio and Mississippi valleys. This is so large a question that, except as to making suggestions covering small sections, we doubt whether any competent engineering authority would seriously undertake to present a solution. Our correspondent favors the idea of constructing a system of "catch basins," or enormous reservoirs, along the headwaters of the Ohio, to hold back the surplus of the spring floods, and then distribute the excessive waters as might be to the best advantage during the year. But how enormous would have to be the capacity of any such storage system in order to be efficient.

If we had a reservoir of something like the capacity of Lake Erie in the mountains of Western Pennsylvania, to be the first receiver of the spring rains and melting snows, it would possibly be effective in preventing the floods, but hardly less than this would suffice.

All the principal tributaries of the Ohio flow from regions where there are only few and small lakes. The Alleghany, the Monongahela, the Cumberland, and the Tennessee drain a vast territory of high land, whose waters rapidly find the low level of the Ohio valley, only to flow very leisurely from there all the long way thence to the Gulf. For particular localities the protection of levees or embankments may be sufficient to keep out the floods, but to hold back this mighty tide of water is evidently impracticable, and those who cannot locally protect themselves have only to retreat in the best way possible from conflict with a power surpassing human energy.

Some Experiments upon the Otto Gas Engine.

Messrs. Brooks and Steward, of the Stevens Institute of Technology, have lately made a series of tests on the Otto gas engine, published in *Van Nostrand's Eng. Mag.*, and the conclusions at which they arrive are valuable, not only on account of the accuracy of the experiments, but also on account of the disinterestedness with which they were made.

As regards the efficiency of the engine (a 10 H. P. Otto), the indicated work represented 18 per cent of the total heat of combustion of the gas, while the actual useful work was 14½ per cent. The dispositon of the heat in detail was as follows:

Indicated work (useful work and friction)	17 per cent.
Hot expelled gases	15½ "
Water jacket	52 "
Radiation	15½ "

It will be seen, therefore, that 52 per cent of the heat generated by the combustion of the gas is wasted and carried off by the water jacket, which thus points out the direction in which improvements can be made that will greatly increase the economic value of the engine.

It also shows that as a *heat engine* the gas engine is superior to the steam engine, since the best of the latter utilize only 10 per cent of the total heat of combustion of the coal, and this only in very large engines, smaller ones showing a corresponding decrease.

The ratio of air to gas was found to be 7 to 1 when the engine was working most economically, thus proving the inaccuracy of the ratio generally given with this engine, viz., 10 to 1; this result was obtained by actually measuring the air as well as the gas which entered the cylinder.

In comparing the commercial efficiencies of an 8 H. P. gas and steam engine, the latter is shown to be more economical, but the cost of gas is taken at $2.50 per thousand feet, and, as the authors remark, the production of a cheap gas especially adapted for heating will bring the cost down to if not below that of steam. But even at the present time, where power is used intermittently, the gas engine may still approach and often exceed the commercial economy of the steam engine.

American Scientists on the Red Sunsets.

At a meeting of the New York Academy of Sciences on the evening of Feb. 11, Prof. John K. Rees, of Columbia College, read a paper entitled "Theories in regard to the causes of the recent red skies." Professor Rees pointed out several of the recorded phenomena before proceeding to discuss the theories as to their cause. There were three theories, he remarked, which were worthy of consideration: That ascribing the glow to the presence of aqueous vapor, that attributing it to cosmic dust, and that finally which traced it to volcanic dust. He considered these briefly in that order, dismissing the aqueous vapor theory as accounting only for the different colored suns. The spectroscopic investigation, which gave weak rain lines and a well defined dry air band, also prevented the acceptance of this theory. The cosmic dust theory was next reviewed, but also met with little favor, as the analysis of the particles which had been collected from snow and rain water proved them to resemble volcanic rather than meteoric matter.

Professor Rees was inclined to believe that the theory which attributed the usual sunsets to the presence of volcanic dust thrown out during the Java earthquake presented less difficulties than either of the others. He stated that this was probably the greatest volcanic eruption on record. Thousands of tons of volcanic dust must have been thrown into the air. In rebuttal of the objection that the speedy settling of such dust would prevent the persistence of the phenomena, he brought forward Professor Crook's theory that the minute particles were negatively electrified, and were therefore not only repelled by the earth but also repelled each other, and thus might be kept in the air for an indefinite length of time. Finally, Professor Rees referred to one or two other theories, electrical and scriptural, which had been promulgated, and also to that which held that the earth is surrounded by a meteoric ring above the equator. This last he considered untenable, as the glows were as perceptible south of the equator as north of it.

Professor Trowbridge than made a few remarks, in the course of which he cordially indorsed Professor Rees' views, and suggested that the upward currents of the air might have much to do with keeping the particles suspended in the atmosphere, and thus account for the persistence of the phenomena. Professor Newberry added the results of his observations, which were strongly confirmatory of the volcanic dust theory.

To Equip a Wheat Farm in Dakota.

"The amount of machinery necessary to plant and harvest the crops of the Northwest," according to the St. Paul *Pioneer Press*, "is enormous. The principal crop of the Northwest is wheat, and as nearly all the labor required to seed and harvest it is performed within a few months, usually from the first of May to the first of October—rarely six months—everything must be done with a rush. Farmers who raise nothing but wheat cannot afford to employ help all the year around, and this fact renders it very difficult to obtain the necessary assistance when it is needed during the busy season. Wages are high on account of this fact, and the wheat raiser finds himself compelled to depend upon mechanical help instead of muscle. It is questionable whether it is more profitable. To properly equip a farm of even 160 acres with all machinery necessary to plow the ground, seed it, harvest and thrash the grain, requires a large outlay of money. The total outlay for wagons, plows, harrows, seeders, and harvesters necessary to work a farm of this size is about $700. This is an outlay that must be made before the farmer can realize from his first crop. It is not to be supposed that cash is required to buy all this machinery. The farmer can buy his entire outfit on credit. Mortgages are often taken, but not as a rule. The agents of reapers and harvesters require no security beyond a simple note of hand. Early in the spring a perfect array of "machine men," as the agents are called, invade the Northwest to take orders. A farmer can buy a harvester or whatever he needs and have it delivered in his field, set up all ready to start, even to being supplied with twine for the binder, by simply giving his note of hand, without security, and drawing 7 per cent interest. These notes run from two to three years, and are often renewed if the interest is properly paid. Some idea of the amount of machinery sold in the Northwest every year may be gained from the statement that during 1883 nearly 1,700 car loads were received at Minneapolis alone, the total number received at St. Paul and Minneapolis reaching nearly 3,600."

Telephone Fortunes.

We can all remember the time when Bell telephone stock went begging, and when some of the largest holders of to-day were almost reduced to the same occupation. If we begin with Professor Bell, we find him down now for a snug fortune of $5,000,000. Mr. Blake bids poverty defiance from behind an intrenchment of $4,000,000. Mr. W. H. Forbes is credited with about as much as both of these gentlemen have put together, and Mr. G. G. Hubbard enjoys as the reward of his early foresight and courage upward of $3,000,000. Mr. Theodore N. Vail, who was at one time an operator, but was from the first marked out for positions of commanding influence, devotes the little time he spares from the general management of the American Bell Telephone Company to the care of a private fortune estimated at not less than $4,000,000. It is also said that among the telephone millionaires must be placed Alexander Cochran and C. P. Bowditch with about $3,000,000 each, and Thomas Sanders with not less than $2,500,000.

These gentlemen have all done very well on the new Tom Tiddler's ground. But there are many others who have found an El Dorado in telephone stock or telephone territory. Take the famous Lowell Syndicate, and not one of its members can complain of any fickleness on the part of Dame Fortune. Mr. Loren N. Downs is said to have three-quarters of a million, and we are inclined to think that that is not the full extent of his capital. Mr. W. A. Ingham and Mr. J. C. Glidden are rated at a cool million each, while Messrs. A. A. Coburn and W. H. Bent would not sell out under half a million each. Mr. O. E. Madden, the assistant general manager of the parent company, is reputed to be worth from $300,000 to $500,000. Among those who have also pulled large plums out of the pie, are named the late Governor Jewell, of Connecticut; W. W. Crapo, C. J. Clifford, and W. Ivers, all of New Bedford; G. W. Piper and A. P. Sawyer, of Newburyport; C. Sanders, of Salem; A. D. Swan and Mr. Knox, of Lawrence; C. F. Cutler and J. C. Clark, of South Framingham; Herrick P. Frost and M. F. Tyler, of New Haven, Conn.; George Howard and Henry Cranston, of Providence, R. I.; G. L. Phillips, of Dayton, O.; H. L. Stork, of New York; A. B. Uline, of Albany; and C. Williams, Jr., of Somerville. This list could be greatly lengthened by additions from all parts of the country, but it includes most of the names of those who were early identified with the introduction of the telephone into public use. It is not to be forgotten that many large manufacturing concerns have done an immense and profitable business in connection with the telephone, and that the Western Union Telegraph Company draws annually now about $400,000 as royalty from the American Bell Company, and is so greedy as to want more.

The various little sums we have mentioned foot up to nearly forty million dollars. If they were only ten millions, they would still be a magnificent yield from the patent in so short a space of time as eight years. We are not surprised that the patent is supposed to be worth, capitalized, about twenty-five million dollars; that the money now invested in operating the telephone is over one hundred million dollars, or that the rapid acquisition of such immense wealth has stimulated invention and aroused cupidity. When the full history of the early days of the telephone in America is written, it will be among the most thrilling of the romances of scientific invention and its commercial development. Ben Butler might, perhaps, after his dark hints, employ his present leisure in writing that history.—*Electrical World.*

A Whistle Heard Thirteen Miles.

The Chesapeake and Ohio Railroad have decided to put upon their passenger engines steamboat whistles. At present six engines are thus supplied, and soon all of the passenger engines will have them. They will be very convenient, both to the public and the employes of the road, as indicating on the approach of a train whether it is passenger or freight.

The Staunton *Vindicator*, in commenting on this innovation in railroading, says that the whistle can be heard at a great distance. A brakeman on one of the night trains coming to Staunton from the West the other night, says when he got home his wife told him she had heard the whistle at a distance in the still night air, had gotten up, made a fire, and cooked his supper by the time her husband reached home. It turned out that the whistle she had heard had been blown at North Mountain, about thirteen miles distant.

Condensation of Carbonic Acid Gas upon the Surface of Glass.

Prof. Robert Bunsen has recently published the results of his investigations upon the film of carbonic acid that adheres to the surface of smooth, clean glass. He found that the quantity gradually increased from year to year, and more rapidly in cold weather than in warm, but change of barometric pressure makes no difference. In three years over 5 c. c. of carbonic acid gas had attached itself to the square meter (1,600 inches) of surface, and had been compressed to 0·05 c. c., which represents the very considerable pressure of 135 atmospheres. Bunsen thinks that there can be no doubt that it exists on the surface in a liquid form.—*Wiedermann's Annalen.*

ENGINEERING INVENTIONS.

A pump has been patented by Mr. Nathan Hemenway, of Napa City, Cal. It is intended more especially for raising water from deep wells and mines, and provides for arranging together several pumping cylinders of twenty-five or thirty feet length each, the lower one supplying the one next above, and each cylinder thus becoming a water reservoir.

A spark arrester has been patented by Mr. Abraham O. Frick, of Waynesborough, Pa. The cone of the smoke stack has an inside sleeve arranged concentrically around its upper end, and above this is a deflector cheaply made of two pieces of sheet iron, which performs the double function of deflector and receptacle for escaping sparks, being itself very light and simple.

An improved car coupling has been patented by Mr. Thomas C. Jones, of Willows, Cal. The drawhead has a U-shaped drawbar connected with the drawrod, with which is a coupling hook held down by a spring and a bow and yoke. With the coupling hook is a lifting bar, a lever with a keeper and catch bar, and an upright bar and its keeper, so the cars can be uncoupled from the side of the track or the top of the car.

An improved car brake has been patented by Mr. Josiah Harding, of Autofagasta, Chili. A screw staff is connected to the elbow lever by a swiveled bearing, the lever being connected by its long and short arms to the front and rear brakes of the car, the shaft by which the lever is made to work the brakes forming one of the brake bars, and the devices employed being almost identical for any form of car, so the hangers, screws, and other parts may be interchangeable.

An electric railway signal forms the subject of a patent issued to Messrs. James C. Upham, of North Sydney, and John P. Rogers, of Elmsdale, Nova Scotia, Canada. The road bed is provided with electric conductors connected together to form blocks of any suitable length in addition to the rails, which are arranged as continuous conductors, and the engines are provided with batteries, electric signaling apparatus, and circuit closing devices.

MECHANICAL INVENTIONS.

A machine for drawing bars has been patented by Mr. John S. Griffin, of Cleveland, O. The machine is intended for drawing iron and steel bars for heavy shafting in one continuous operation, the bars being cut the proper length, their ends heated to allow the thickest part to be drawn clear through the dies, when the operation is performed automatically.

Clothing for pulleys forms the subject of a patent issued to Mr. Gilman Jaquith, of Maysville, Ky. This invention provides for increasing the friction on the driving surface of the pulley, and making a better bite or hold for the band, and for this purpose a thread is first made on the pulley surface, then the surface is treated with a composition coating, after which strong thread is wound on, and then another composition coating added.

AGRICULTURAL INVENTIONS.

A combination plow has been patented by by Mr. Jeff. D. Pace, of Arcadia, La. In combination with a plow shoe and standard is a brace plate, flush with the straight side of the shoe, some distance below its upper edge, and receiving an angled plow plate, so the plow may be readily converted from a scooter into a mould board or turning plow.

A grain sacker has been patented by Mr. Richard H. Purnell, of Rosedale, Miss. This invention provides that, when cotton seed is thrown into the machine in its usual lumpy and mixed condition, they will be separated, the seed deposited in a sack, weighed and held to be sewed, the machine being also adapted to separate shelled corn from the cobs, and to sack and weigh the former and other grain.

A roller attachment to grain drills has been patented by Messrs. James M. Wishart and William F. Bozick, of Topeka, Kansas. This covers such improved arrangement of roller attachments to grain drills as will give a better action, and be more substantial and durable than those now in use, the weight of the frame being equally distributed on the rollers, while the rollers are free to assume any position the irregularities of the surface may require.

MISCELLANEOUS INVENTIONS.

A sofa bedstead has been patented by Mr. Joseph McGrath, of Newton, Kansas. This invention covers a new and improved hinge for hinging the removable seat or top of a sofa bed, lounge, extensible chair, or other like piece of furniture, to the seat frame.

A driving cuff and wristlet has been patented by Mr. Byron E. Northrup, of Broadalbin, N. Y. In combination with a gauntlet or cuff is a flexible wristlet with an elastic webbing, the wristlet being made of kid or other suitable leather or of woven or knit fabric.

A gate operating apparatus has been patented by Mr. Henry Ziegler, of North Lima, O. This is a device for opening and closing gates without dismounting from a carriage, by pulling a rope at either side stretched along the side of the roadway from the post whereon the gate is hinged.

A napkin ring and holder has been patented by Mr. Gus A. Bahn, of Austin, Texas. It consists of a yoke-shaped piece of metal with a hinged section connecting the two ends, and serving as a ring, in combination with a clasp for holding the napkin, if desired, at the throat.

A cigar stand has been patented by Mr. Charles N. Swift, of New York city. This invention covers an upper and a lower plate, suitably held apart, perforated for the reception of cigars, and made adjustable for cigars of different lengths, so it will hold the cigars without danger of breaking the wrappers.

An adding machine has been patented by Mr. Albert K. Barmore, of Benton, Texas. The invention covers a special construction and combination of parts in a machine, of which the wheel is actuated by the operator to advance at each movement as many teeth as there are units added by that movement.

A shot case has been patented by Mr. Quincy A. Ellis, of Gatesville, Texas. The case is tapering, and so hung upon a rod that its spout will be upward, but this is fitted with a device which enables a definite quantity of shot to be withdrawn, on tipping it down, without weighing, for the convenience of retailers.

A machine for extracting and cleaning the fibers of plants has been patented by Mr. Philip Cohn, of New Laredo, Tamaulipas, Mexico. Dull edged knives are arranged spirally upon a roller, fitted to revolve at a high speed, whereby the outside of the plants is broken and scraped, and the soft parts or meat of the inside is also scraped off.

A machine for scraping and cleaning intestines has been patented by Mr. Andrew M. Woods, of Shiloh, S. C. A rotating drawing roller is fitted with a suitable clamping device for grasping an end of the entrails, and a contiguous die plate, through the apertures of which the entrails are drawn by the revolution of the roller.

A combined automatic floor and safety clutch for elevators has been patented by Mr. Thomas H. Wood, of Philadelphia, Pa. This invention provides for a safety floor for elevator shafts, which is opened and closed automatically as the car rises and falls, with which is combined a safety clutch to hold the car whenever the cable breaks or gives way.

An apparatus for revivifying bone black has been patented by Mr. Edward P. Eastwick, of New York city. This invention seeks to effect a further saving in fuel than is possible by present methods, so the heat given off from the bone black coolers is utilized and also the heat contained in the heated air that has been passed through the bone black in the drier.

An extensible latch has been patented by Messrs. Brommie Copeland and Frank Wright, of Salem, N. Y. An extensible latch bolt, with a block swiveled on a screw, and connected by the latter to a piece provided with a screw threaded aperture, affords means by which the bolt can be adjusted to extend or project a greater or less distance from the edge of the lock casing.

A striking mechanism for eight day clocks has been patented by Mr. Edward A. Muller, of Louisville, Ky. This invention covers special details in the construction of the alarm mechanism, whereby the quarter, half, and three-quarter hours are struck on a gong and the full hours on a spiral spring, thus making different sounds; the clock also has a second hand and an alarm.

A whip holder has been patented by Mr. St. George J. Boswell, of Quebec, Canada. The socket is fastened to one end of lazy tongs, the opposite end of which is secured to the vehicle and connected with devices for extending the lazy tongs, so the whip can be brought within easy reach of the hand when required, or the holder will be out of the way when not in use.

Watering apparatus for hot houses forms the subject of a patent issued to Mr. Warren H. Howe, of Marlborough, Mass. This invention covers a system of distributing perforated pipes suitably suspended in the house, connected with an elevated supply tank or pump, and with suitable regulating cocks, whereby the moisture and temperature of the air may be readily regulated.

A wire stretcher has been patented by Messrs. William H. and Jeremiah W. Bliss, of Hamilton, Mo. The invention covers a reel support, brake, and guides, to attach to a wagon box to be driven along the line of fence posts, for delivering wires to be attached to the posts and for stretching them, the reels being readily taken out when desired, and the wire being wound thereon with facility.

A refrigerating counter for bar rooms has been patented by Mr. Charles E. Crockett, of Waupun, Wis. This invention combines with a refrigerating counter an ice box of two or more sections, with hollow walls, each section having a horizontally projecting work board. One section also has pigeon holes for bottles, spices, sugar, etc., and an air forcing apparatus is provided for to force air around the hollow walls.

A cockle separator has been patented by Mr. James M. King, of Rochester, Minn. There is a connected series of inclined screens, having detents in combination with a series of transversely arranged guttered bars, within which the detents are located; there are also imperforate smooth-faced plates secured to the lower or forward sides of the detents, in combination with the guttered bars.

A fire escape ladder has been patented by Mr. Arnold M. Downing, of Oneida, N. Y. It consists of a folding ladder formed of a series of linked rods united at every second joint by a transverse rod or rung, forming a ladder which can be folded very compactly, so that a ladder a hundred feet long can be contained in a box eighteen inches long, eight inches wide, and four inches deep.

A tree protector has been patented by Mr. Franklin R. Hogeboom, of Brooklyn, N. Y. This invention covers an incircling trough, made in semicircular sections, to hold kerosene or other insect destroying fluid, which may be readily attached to the tree at a distance from the ground; flexible flaps are provided, to conform the protector to the size or irregularities of the tree, which is thus made secure against the ravages of caterpillars and other insects.

An ironing machine has been patented by Messrs Henry Podger, of Bromley, County of Kent, and William H. Davey, of Highgate, Middlesex County, England. It is specially adapted for ironing shirt fronts, collars, etc., and consists mainly in the combination, with a vertically adjustable and horizontally moving table, of a longitudinally reciprocating iron; there is also a gas heated iron, double faced and reversible, so that one face is being heated while the other is used.

A dental engine attachment has been patented by Mr. Jesse W. Norwood, of Greenville, S. C. The invention covers the peculiar construction and arrangement of a pneumatic pump and the means for regulating its stroke, as well as means for supporting it and throwing it into and out of gear, to better adapt such engines for using the pneumatic plugger. A dental plugger has likewise been patented by the same patentee, in which the mallet operates as a piston in the hollow handle, and a sheath takes the frictional wear which would otherwise rapidly reduce the soft metal, the holder of which is adapted to form an air tight joint with the chamber of the handle.

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Special.

JUDGE KELLEY'S VIEWS.

The Hon. William D. Kelley, of Philadelphia, has long been known for his fearless advocacy of the right, and his uncompromising opposition to the wrong. Since 1860 he has been a member of the House of Representatives of the United States. He has always been known as a man of positive counsels, a powerful speaker, an earnest debater, an able thinker, and an unwearying worker.

Judge Kelley has been so long and so prominently before the American people, that his sentiments on any important subject are valued, even by those who do not agree politically with him. He is emphatically a man of the people. Elevated to the Judgeship many years ago, he proved to be a man of such unswerving integrity, such earnestness of purpose, and such depth of conscientious conviction, that he was for a long term of years retained on the judicial bench; and on his desiring to retire to the comparative seclusion of an extensive law practice, was told by the people that he must serve them in Congress. For twenty-three consecutive years his Congressional service has been rendered with singular fidelity and purity. His utterances are well known to come from his inmost heart, and his opinions to be the result of the most mature deliberation. The judgment of such a man carries with it immense weight, and his views, whether on public affairs or private interests, are entitled to the respect and esteem of all thoughtful persons.

Judge Kelley's power of resistance to obstacles which would have put an ordinary man in his grave has long been the subject of comment, not only among his friends, but by the public generally. Such was his physical condition ten years ago, that it was feared that the next Congressional session would be his last.

For many years the Judge had been afflicted with the most obstinate catarrh, which defied all the old fashioned remedies, and which would have entirely laid on the shelf a less indomitable man than himself. His life became almost a burden to him, and he was nearly at death's door. To-day, although at an age when most men begin to show signs of wearing out, he is hearty and vigorous, and as ready and as able to perform his arduous Congressional duties as he was twenty years ago.

An account of Judge Kelley's remarkable case, as given by himself, will be of interest to all who are suffering with Catarrh, and who are wondering what they shall do to get rid of this horrible disease. One of our editors recently spent a morning with Judge Kelley at that gentleman's home, in West Philadelphia. To him the Judge communicated the history of his illness and recovery, substantially as follows:

"I had, as a hereditary victim t Catarrh, suffered for years. I was subject to violent paroxysms of coughing. Straining for relief had produced abrasion of the membranes and daily effusion of blood from my throat. For four years I passed a portion of each Congressional vacation in the Rocky Mountains or on the Pacific coast. While there, I found relief; but on my return to tidewater, the disease appeared with apparently renewed vigor. My breathing power diminished, so that in the early summer of 1873 it was little more than a panting for breath. About two years before this my attention had been called to Compound Oxygen Gas as then administered by Dr. Starkey. A friend who had great faith in its efficacy advised me to try it. On reading Dr. Starkey's advertisement I threw the little book aside, and declined to resort to the treatment, on the ground that it was a quack medicine which proposed to cure everything, and was consequently without adaptation to any particular disease. I grew worse, and in the summer my breathing was so short that a cough, a sneeze, or a sigh produced such acute pain at the base of the left lung, that I felt it necessary to close up my affairs, as I did not believe I could last for sixty days. Nor do I now believe I would have lasted for that time, had I not found a potent curative agent.

"I had lost none of my prejudice against the gas, as a medicine; but in very desperation, seeing that it could not make me any worse than I was, and as medical treatment had utterly failed to meet my case, I concluded to try it. After a thorough examination, Dr Starkey, to whom I was then a stranger, said: 'Sir, I have no medicine for either form of your disease (alluding to the Catarrh and the bleeding at the throat), but if you will give me time I will cure you.' My response was a natural one: 'You are frank in saying you have no medicine for either form of my disease, and yet you propose to cure me. By what agency will you work this miracle?' 'The Oxygen Gas,' said he, 'is not a medicine. It has none of the characteristics of medicine compounded of drugs. These create a requirement for continual increase of quantity to be taken; and, if long persisted in, produce some form of disease. But the gas produces no appetite for itself. It passes by inhalation into the blood, and purifies and invigorates it. The system is thus enabled to throw off effete matter. You will find by experience, if you try the treatment, that it will not increase the rapidity of the action of your pulse; though the beating thereof will be stronger under its influence.'

"This explanation removed my objections, and I could see how such an agent could operate beneficially in cases of widely different symptoms and character.

"Dr. Starkey said that the cells of my left lung were congested with catarrhal mucus, and that he believed the gas would at once address itself to the removal of the deposits, and the restoration of my full breathing power.

"I entered on the use of the treatment, and at the end of three weeks, with an improved appetite, with the ability to sleep several consecutive hours, with a measurable relief of the pain in the lung, and with Dr. Starkey's consent, I made the tour of the lakes from Erie to Duluth, in company with my venerable friend Henry C. Carey. Returning, we visited friends in St. Paul, Chicago, and Pittsburg.

"Notwithstanding the intense heat, I remained in Philadelphia during the summer, and inhaled the gas daily, with the happiest effect. Before Congress assembled in December, my lung had been relieved of much of its nauseous deposit, and I was able to breathe without pain.

"Without detaining you with detail, I may say that in the progress of my recovery I had occasional hemorrhages, which always preceded a palpable step in the progress of recovery; so that I came to regard these unwelcome visitors as part of the remedial action of nature, assisted by Compound Oxygen Gas.

"I am now more than ten years older than I was when I first tested the treatment. I have had no perceptible effusion of blood for more than six years. I breathe as deeply as I did at any period of my young manhood, and my natural carriage is so erect as to elicit frequent comment.

"I have regarded my case as a very extraordinary one, and yet I have had under observation one which I regard

as more remarkable than my own. That of a young lady, who had been paralyzed by fright or contusion when her horses ran away and her carriage was destroyed; and to whose father Dr. Starkey, after examining the case, said she was beyond the reach of human agency. I know her now as a happy wife and mother, restored to most excellent health.

"You may judge of my restoration to health by the contrast between the results of some of my recent Congressional debates, compared with what they were in 1874. In that year when I spoke in the House in favor of the grant by the Government to the Centennial Exhibition, I was so prostrated by the exertion, that my dear friend, the late Col. John W. Forney, left the gallery, in which he had been sitting, in order to come to the door of the hall to assist in relieving me when I should fall. I found, on quitting the floor, that there had been a general fear that in my zeal I was passing beyond the bounds of prudence.

"But on the fifth of May, 1882, when submitting an argument in favor of a Tariff Commission, I held the floor for nearly three hours, though parts of the debate might be characterized as a wrangle between myself and others; and as I did not obtain the floor until the afternoon, I surrendered it, because the close of the day had come, when members' appetites told them that dinner was on the table. The evening was passed in my rooms, with a high degree of sociability, in which a number of young ladies and gentlemen from my district, who happened to be in the House during my speech, participated.

"On a recent occasion I addressed five thousand people in the Philadelphia Academy of Music, without feeling any exhaustion. I have a hearty appetite, and am able to take abundant exercise. I sleep well, and have a far better color in my cheeks than I had ten years ago.

"You ask if I still continue the treatment. Whenever I am in Philadelphia, and feel a fresh cold, or suffer from the nervous exhaustion which follows excessive labor, I go to the office of Drs. Starkey & Palen, and resort to the treatment, and am never without the 'home treatment' in Washington. I have the highest confidence not only in the treatment itself, but in Drs. Starkey & Palen as gentlemen of skill, integrity, and good judgment."

To learn all about COMPOUND OXYGEN, write to Drs. Starkey & Palen, 1109 Girard Street, Philadelphia, for pamphlet setting forth full particulars.

NEW BOOKS AND PUBLICATIONS.

THE AIR WE BREATHE, AND VENTILATION. By Henry A. Mott, Jr., Ph.D., E.M. John Wiley & Sons, New York.

In this book are briefly presented some elementary truths, with a practical dissertation on ventilation by the aspirating system, or that which undertakes to withdraw the foul air, leaving the fresh air to take care of itself.

THE AMERICAN FLOUR MILL AND MILL FURNISHER'S DIRECTORY. E. Harrison Cawker, Milwaukee, Wis.

It is said a Washington Solon was recently "posed" on the question as to what manufacturing industry represented the most money in the United States, when his interrogator "enlightened" him by saying it was the milling industry. Now, the products of flouring and grist mills, by the census of 1880, were $503,185,000, representing, of course, more than the manufactures of any other industry, but the materials which these mills ground up cost them $441,500,000, which go to the credit of our agricultural production. The millers, however, do a big business; there are over 24,000 establishments, employing a capital of $177,000,000 and some 60,000 hands. To make a good directory of this great business is no small job, but this is what Mr. Cawker, of the *United States Miller*, Milwaukee, has attempted. There are over 25,000 flouring mills in the United States and Canada noted, and the book indicates in many instances the kinds of flour made, the capacity of the mills, the power used, etc. The book is evidently the result of great labor and studious attention to details.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at the office Price 10 cents each.

Correspondents sending samples of minerals, etc., for examination, should be careful to distinctly mark or label their specimens so as to avoid error in their identification.

(1) A. B. W. writes: I have tried several kinds of rubber cement for soling and patching rubber boots and shoes, but they have not given satisfaction, the patches and soles coming off in a week or ten days' wear. Please inform me how to make a cement that will do this work satisfactorily? A. The ordinary rubber cement which is so much used by fine shoemakers is made by dissolving a quantity of gutta-percha in chloroform or carbon disulphide until the solution has the consistency of honey. Thin down the parts to be cemented, then spread a small quantity of the cement well over the parts to be joined. Warm the parts over a flame or fire for half a minute, bring the surfaces to be united together, and hammer well or clamp firmly. The cement dries in a few minutes.

(2) C. E. W. asks: 1. Is compressed air machinery very expensive? A. Pumps for compressing air that are in the market are large and expensive, and made to run by steam pump—and engine attached. 2. Can it be used to advantage in connection with a wind engine? A. A pump for a wind mill to work as a compressor has not yet been utilized that we know of, although there has been a great deal written and published upon that subject of late. 3. Could an amateur with a good screw cutting foot lathe and a reasonable degree of inventive genius produce a satisfactory machine for said purpose? A. An amateur could make a more or less perfect compressor according to his ability. 3. Will you be kind enough to give working drawings and description of a cheap compressor and receiver, together with a pneumatic engine? A. We could not give you designs or drawings suitable for your wants. A compression pump is nothing more in design than the ordinary suction pump with order of the valves reversed. The pneumatic engine for running by compressed air is not essentially different from a steam engine.

(3) M. O. K. asks for a formula for making marine glue for putting canvas on to a small boat. One that can be applied to the wood and, after it has set the canvas ironed on with a hot flat iron? A. In SUPPLEMENT, No. 158, are given a number of formulas for glues, including marine glue. The following may also be found suitable: 3 to 4 parts India rubber, dissolve in coal tar benzine, add to the thickish fluid 65 parts powdered seedlac. This glue must be heated to about 248° Fahr. before applying.

(4) C. W. H. asks for a receipt for making a paste that will keep paper labels on tin boxes? A. Use a dilute solution (1 to 20) of white gelatine or isinglass, or Starch paste with which a little Venice turpentine has been incorporated while it was warm.

(5) H. L. O. asks: How cold would this earth become if all heat was removed, both artificial and natural? A. The earth's surface would rapidly cool down to the temperature of space, if removed from the influence of the sun. We do not know how cold space is by any experiments or observations.

(6) S. M. asks for formula for making a good quality of baking powder?

A. Powdered cream tartar	30 oz.
Sodium bicarbonate	15 "
Flour	5 "

All well dried; mix thoroughly, and keep dry.

(7) C. W. S. asks: What is the salt solution—salt dissolved in the nitrate of silver? Will this process do to strip the tin from tin cans, etc.? A. Salt solution is ordinary salt dissolved in water. This solution precipitates the silver as chloride, which when fused with borax reappears in its metallic form. This process is not applicable to the separation of tin from tin cans.

(8) J. A. T. writes: In silver plating on steel and Britannia metal I found that the silver does not adhere firmly, but peels off when burnished. Can you tell me how to prevent it, or how those two metals are prepared before they are plated? A. Thoroughly clean the articles. Put on the first coating with a strong battery and strong solution (striking solution).

(9) J. S. McD. asks for a liquid that will not freeze, that can be used safely without injury to packing in hydraulic cylinders? A. Try alcohol, or water with a small percentage of glycerine added.

(10) H. B. C. asks why, if the positive pole of a sulphate of copper battery be connected with the negative pole of a bichromate of potash battery, or *vice versa*, little or no current flows between the remaining poles? A. It is simply because the current from one battery nearly or quite counteracts that from the other battery.

(11) J. W. B.—The following is given by certain authorities as the composition of Hostetter's bitters:

Calamus root	2 pounds.
Orange peel	2 "
Peruvian bark	2 "
Gentian root	2 "
Colombo root	2 "
Rhubarb	8 ounces.
Cinnamon	4 "
Cloves	2 "
Diluted alcohol	4 gallons.
Water	2 "
Sugar	2 pounds.

(12) W. J. J. asks what makes the water crack and bang in steam pipes, especially in pipes for heating houses, stores, etc., when the steam is turned on? A. It is generally attributed to the condensation of the steam in the pipe. Sometimes a water hammer is produced by the current of steam driving the water before it.

(13) G. B. F. asks: What, if any, other transparent hard stone than a diamond crystallizes in dodecahedron form in which all of the natural facets are convex? Weight of stone I refer to is 12·8 grains, has no shade of color, is symmetrical in form, clear as a drop of spring water, so hard that emery will not scratch it, specific gravity a little over 3½. I pronounce it a diamond, having seen many rough diamonds, and this is the most perfect in its crystalline form which I have ever seen. What would be its probable value at present rates, if the stone is such as I have described? A. From the description, the nearest mineral that it would resemble besides the diamond is the white topaz. The hardness of the latter is but 8, while the diamond is 10, and the corundum gems, such as ruby, sapphire (the same composition as emery), are 9. Its value as a diamond cannot be estimated unless examined. In England, a diamond weighing 1 carat (3·2 grains troy) and of the purest water is worth, when cut and polished, £12. From this as a starting point, the price increases with the square of the weight multiplied by 0·12.

(14) N. J. S. writes: Can you recommend any application that will render the pine floor of a hemp twine mill imperfectly combustible? Covering with sheet iron is not practicable, "fireproof" paint will wear off, and salt solutions cause too much dampness. A. Nothing will readily penetrate a pine floor to a sufficient distance to be of any service. Better give the floor a coating of asbestos fireproof paint, and renew it from time to time in the worn places.

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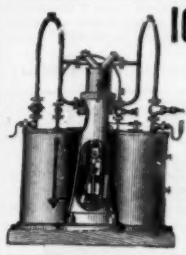

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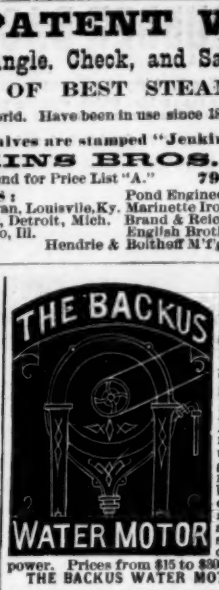

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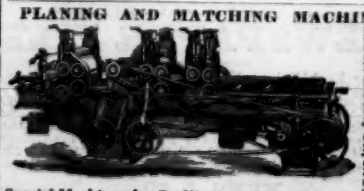

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